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Great glue-ups
guaranteed, p. 44



Build a Tool Chest

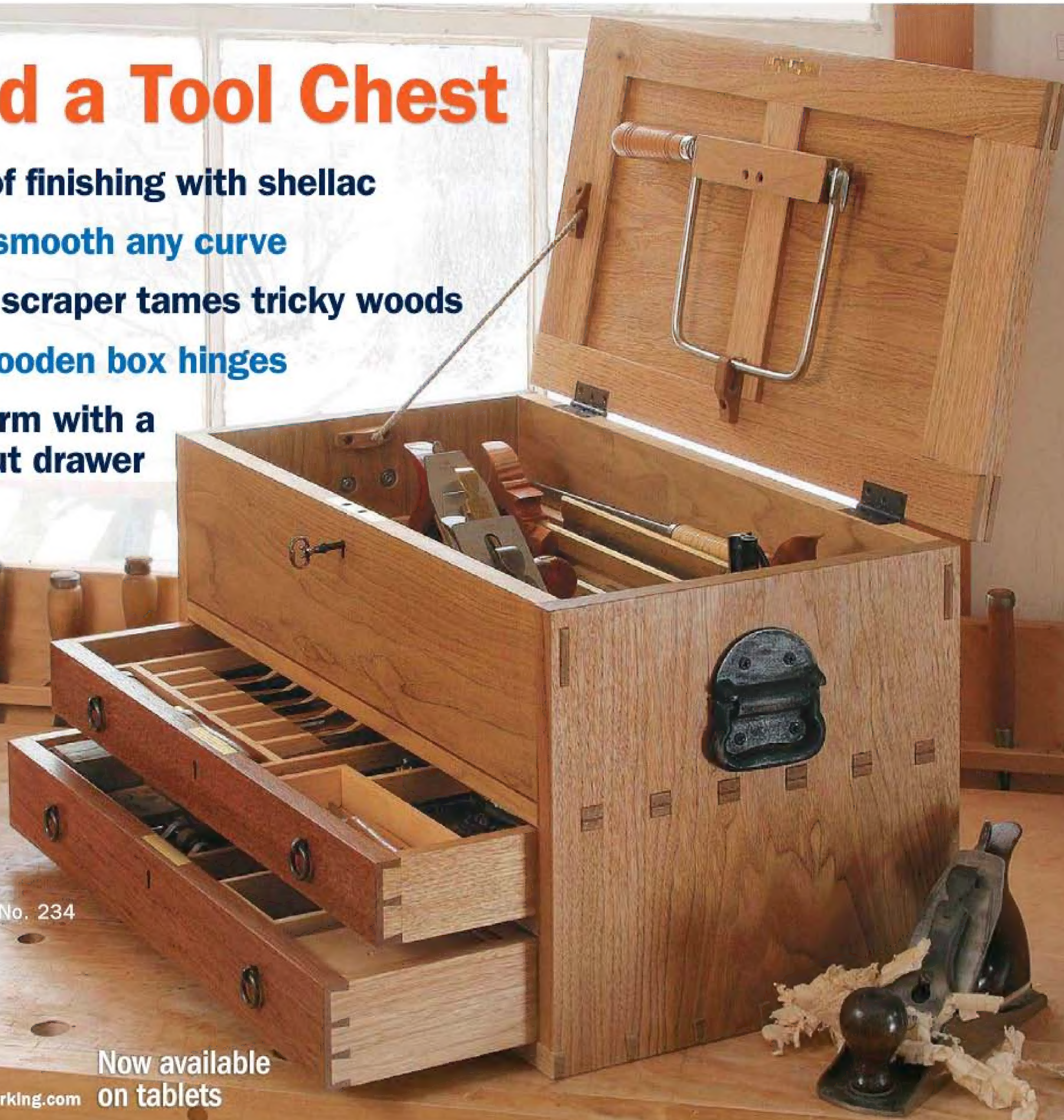
Foolproof finishing with shellac

How to smooth any curve

Cabinet scraper tames tricky woods

Make wooden box hinges

**Add charm with a
swing-out drawer**



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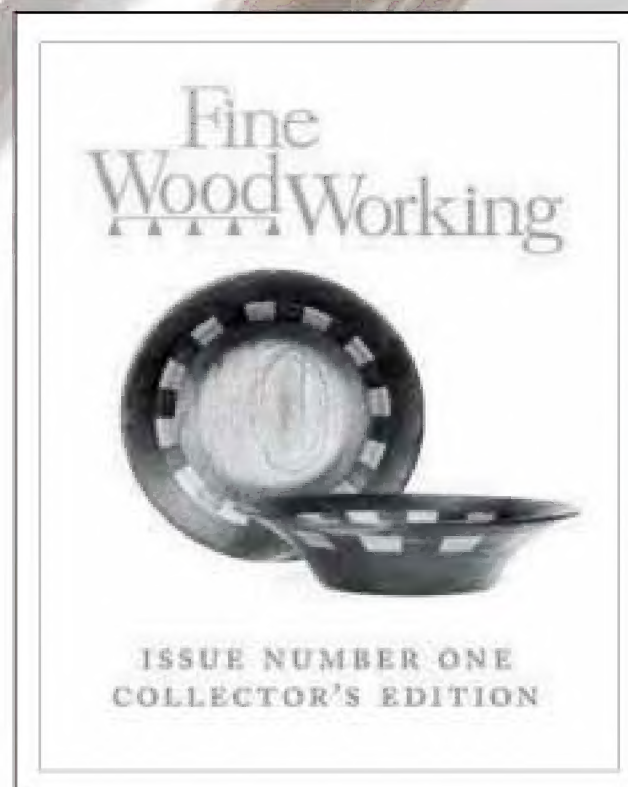
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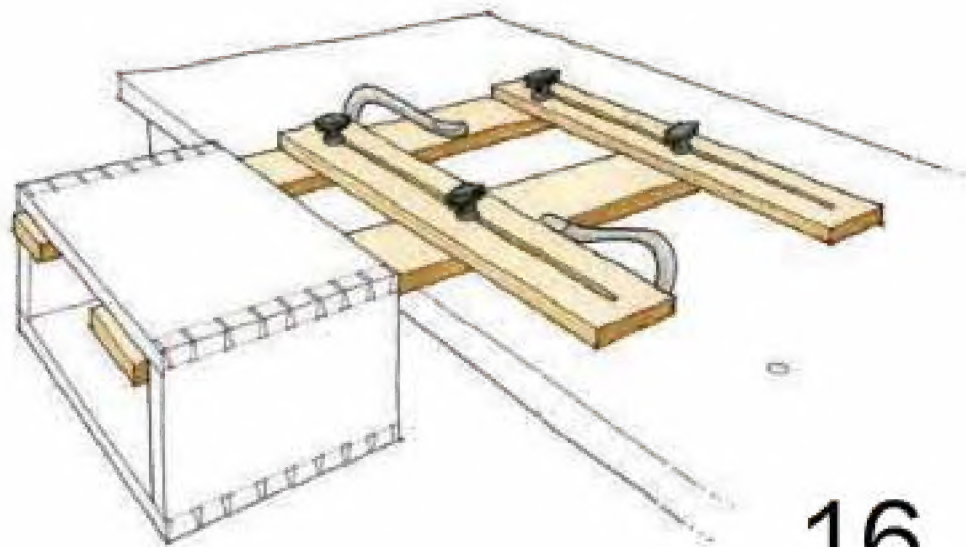
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on the web

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Visit our website to access free web tie-ins, available June 6. While you're there, don't miss our collection of free content, including tool reviews, an extensive project gallery, and must-read blogs.



VIDEO

Essential Hand-Tool Kit

While designing his traveling tool chest, Mike Pekovich found out which tools really matter.



VIDEO

Vacuum Bagging: Get Started for Less

You can build your own vacuum press for a lot less than you think. Plus, tips on how to get the most from your press.



VIDEO

Curved Cauls in Minutes

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VIDEO WORKSHOP

Strictly Stickley

Build a book rack inspired by Gustav Stickley's classic no. 74 in a brand-new video series with furniture maker Gregory Paolini. Lessons include how to:

- Achieve a book-matched look from thinner stock
- Cut out both sides, including joinery, with a single router template
- Get a rich Mission oak finish with a simple ammonia-fuming method



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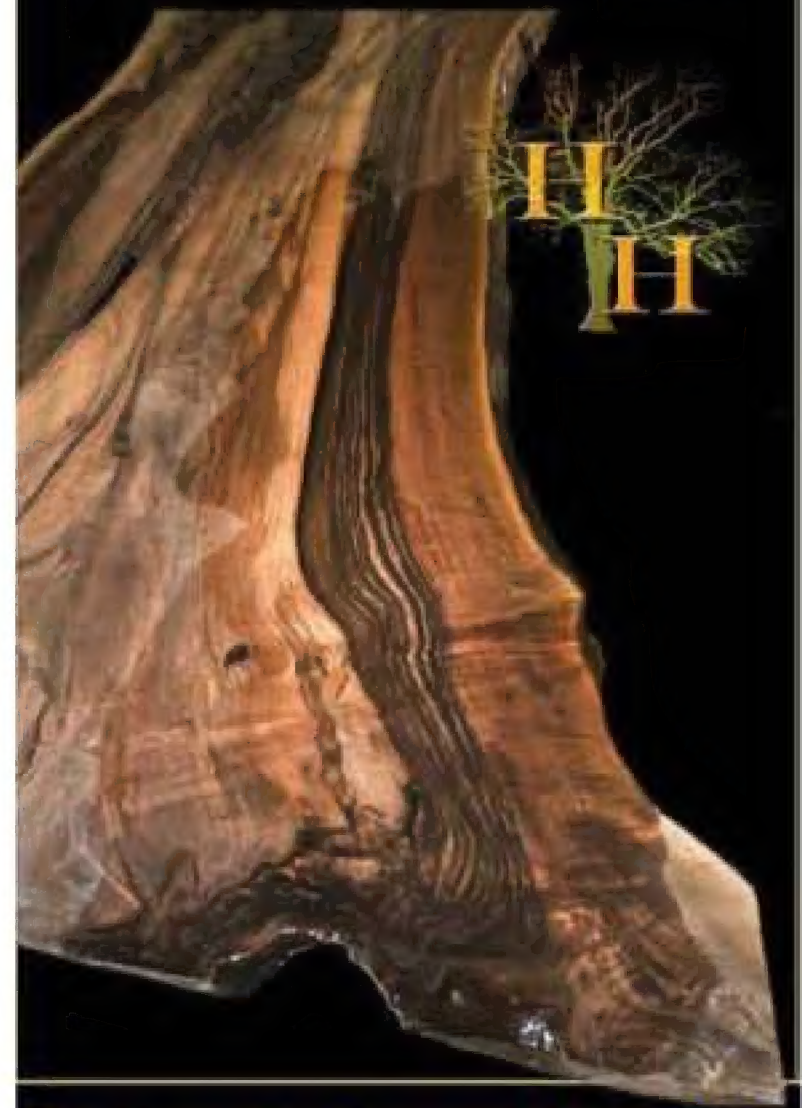
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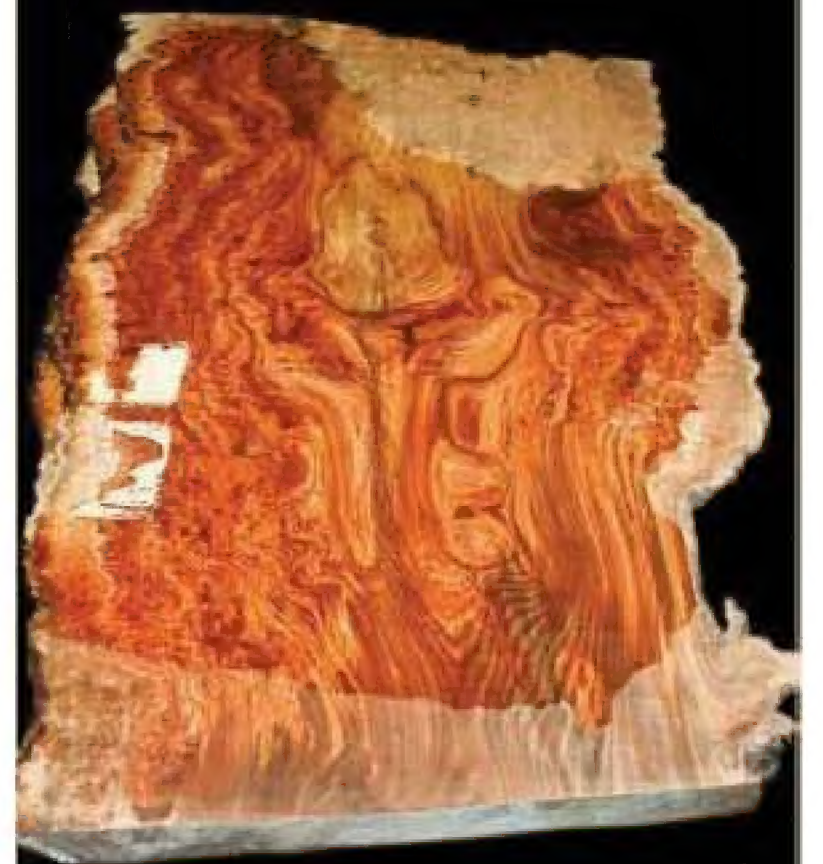


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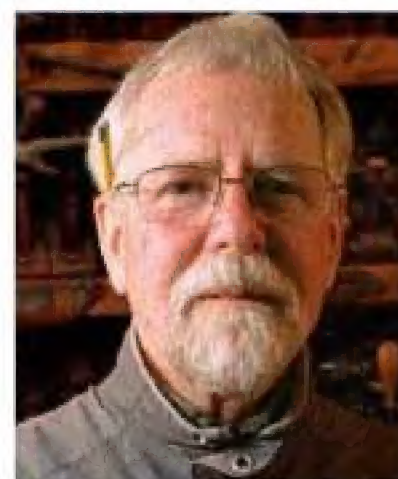
Dan Faia (featured in "A Journey to Bombé") is a custom furniture maker and the head of the Cabinet and Furniture Making program at Boston's famed North Bennet Street School. This year he put all of his woodworking skills to the test, taking on the crown jewel of woodworking, a bombé chest of drawers—and he made it look easy. He says the project rekindled his passion for hand-tool woodworking and reduced his reliance on machines. In his spare time, Dan heads outdoors to hike and fish with his wife and their Irish terrier.

Your most "untraditional" woodworking tool? "A welder's seaming hammer that I use for pressing in inlay."



Philip C. Lowe (Handwork: "You need a cabinet scraper"), owner and director of his own woodworking school, the Furniture Institute of Massachusetts, is also a well-known teacher at schools throughout North America. He is a winner of the 2005 Cartouche Award, the highest honor given by the Society of American Period Furniture Makers, and the 2010 Artisan Award by the Institute of Classical Architecture & Classical America.

You own a sailboat. Is it wooden? "I do own a sailboat but I gave up the wooden ones. I like sailing them more than working on them."



Craig Thibodeau ("Choosing and Preparing Veneers") moved recently to a home within walking distance of his shop (ctfinefurniture.com) near the Little Italy district in downtown San Diego. He is working on a commission involving multiple pieces for a client in the Northeast.

Best shopmade tool? "I converted an old belt sander into a stationary sander with a curved platen for cleaning up curved workpieces. It works like a dream."

Jeff Miller ("Smooth Curves by Hand") is a longtime contributor. His most recent book, based on years of work and teaching, is *The Foundations of Better Woodworking* (2012, Popular Woodworking Books). Jeff teaches and builds furniture in his shop (furnituremaking.com) on Chicago's north side, a few blocks from Lake Michigan. He is working on a prototype for a new line of chairs.

Most unique tool? "One of my bandsaws is a Jones Superior (made here in Chicago) dating back to 1909, as best I can tell. It has 36-in. wooden wheels."



For more information on our contributors, go to FineWoodworking.com/authors.

We are a reader-written magazine. To learn how to propose an article, go to FineWoodworking.com/submissions.

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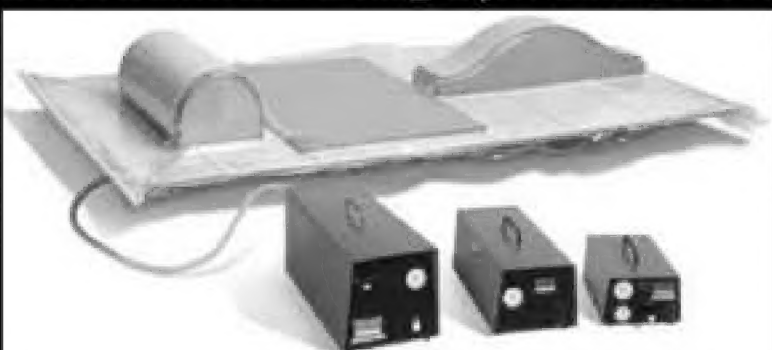
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From the Editor

THE BEST WOODWORKING DEAL YOU DON'T KNOW ABOUT

Reading through the comments in recent reader surveys, we were surprised to learn that many magazine subscribers still don't know about the big break they can get on online membership.

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But if you do subscribe, online membership is only \$15 per year, 20 bucks off the full price. That's a cheap cup of coffee per month to turn the best woodworking magazine on the planet into the greatest all-around woodworking resource on this blue marble, giving you exactly what you need, at any hour of the day or night. If you are a subscriber but choose not to take advantage of the online deal, you can get interactive



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Recent article prevented a serious tablesaw injury

Last night I read Marc Adams's article on tablesaw safety (*FWW* #233). Today I was using my saw, heeding the advice in the article about standing to the side with my hip touching the saw, something I have become lax about. I was ripping some tongue-and-groove boards when the skinny offcut tongue was caught by the blade. It shot through the wall about 6 ft. behind me. I don't want to think about what damage that arrow might have done to me had I been standing behind the blade. Thank you for the article. Now I need to make a splitter before starting my next project.

—JIM LAUREL, Anacortes, Wash.



Out of harm's way. In his recent article, Marc Adams showed where to stand for good control and safety.

Vintage machinery is worth the effort

I was thrilled to see the special Readers Gallery section, "New Life for Old Iron," in the most recent *Tools & Shops* issue (*FWW* #230). I have recently been bitten by the bug, meticulously restoring an old Delta 14-in. bandsaw that was given to me. It took about two months and \$150. It now looks and works like it did in 1944, and with its abundance of cast iron, works better than most of the machinery you can purchase today.

—ALEX KURIMSKY, Rensselaer, N.Y.

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—Asa Christiana

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Using the rip fence as a stop

In "Doors that Stay Flat" (FWW #232), Steve Latta uses a miter gauge in conjunction with the rip fence as a stop. I was always taught this was a definite no-no. Why not clamp an auxiliary stop to the rip fence instead of risking an accident?

—CARL STEPHENS, Northville, Mich.



Editor replies: Latta was cutting tenon shoulders, which is not a through-cut. Therefore, there was no dangerous cutoff to get trapped between the fence and blade. Had he cut the cheeks first, however, the waste piece would have been freed, and he would have done just what you advise.

Improving a dust collector

In "Soup Up Your Dust Collector" (FWW #232), Asa Christiana recommends either adding a separator or adding a Thien baffle. Why not do both?

—BARRY SALTSBERG, Plainview, N.Y.

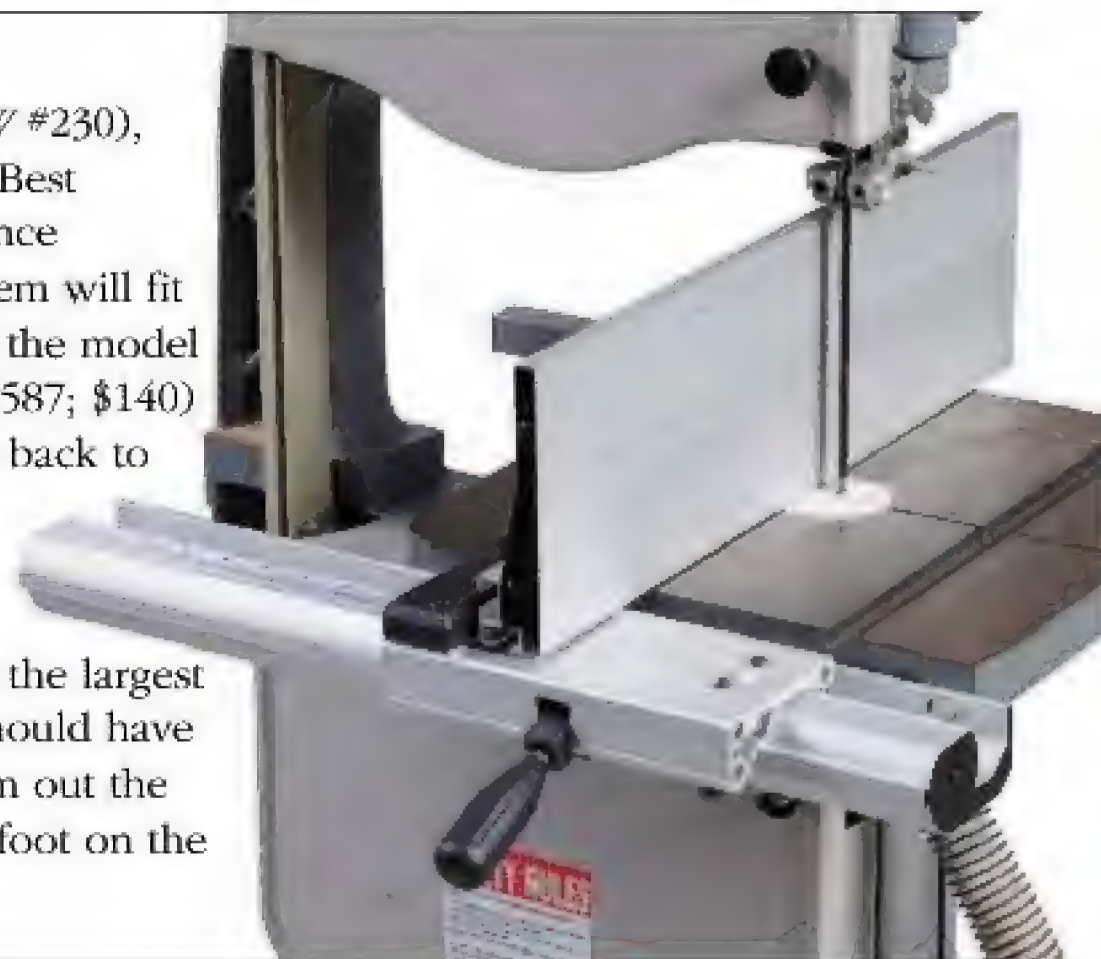
The author replies: We didn't test that, but it probably wouldn't help much. Teaming up a separator with the baffle will keep even more dust out of a fine filter, but the increased airflow would be counterbalanced by the added drag of having both systems in place.

Dangerous use of bench grinder?

I just read Master Class ("Customize your carving tools," FWW #232) and would like to point out that using the side of a

Clarification

In "Tool Test: Bandsaw Fences" (FWW #230), we created some confusion with our Best Overall winner, the Grizzly Resaw Fence Complete. We explained that the system will fit a wide variety of saws, but gave only the model number and price for 14-in. saws (H7587; \$140) with tables no larger than 14 in. from back to front. For larger bandsaws and/or larger tables, you'll need the H7588 or H7589 models, both around \$160. Specs are available at Grizzly.com for the largest tables those fences will fit. We also should have explained that you might have to shim out the back rail with spacers to get the rear foot on the fence to land on the rail properly.



grinder wheel is dangerous and could cause violent failure of the wheel. OSHA agrees.

—TERRY HAFNER, Jarvis, Ont., Canada



Editor replies: This is where industrial safety rules, designed to protect unskilled workers in all types of situations, are over the top in a specific woodworking context. There is no problem here, as the author is grinding small tools against a white wheel, which stays sharp by shedding its worn abrasive as it's used, meaning he doesn't have to press hard. In fact, you should always use light pressure when grinding.

Why pay more for online content?

I am seriously thinking about dropping my magazine subscription. I am fed up with the way you run the online services. I try to read the email newsletter you send, and invariably the item I want to follow up on is in the "members-only" section of the website. Since I subscribe to the paper copy, it seems like the entire newsletter and website should be open to me. I think I have already paid my share toward making it so.

—ROLAND WEISSER, Whitfield, Miss.

Web editor Ed Pirnik replies: We get letters like this sometimes, and I understand the frustration. It's important to realize that the print magazine and the website are two different products. We run the magazine as we always have, and the price has not changed in many years. On the other hand, we now produce a great deal of material exclusively for the website, at high quality and high cost. We do promote some "members-only" items in the e-newsletter, like the combination square video you referred to, but we are always careful to provide a related piece of content beside it, for free. For more of the story, see this month's Letter from the Editor on p. 10.

About your safety

Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't perform operations you learn about here

(or elsewhere) until you're certain they are safe for you. If something about an operation doesn't feel right, find another way. We want you to enjoy the craft, so please keep safety foremost in your mind.

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Best Tip Wedge keeps vise from racking



Chris Gochnour uses his bench and hand tools extensively in his Salt Lake City shop. He has written frequently about hand tools and other topics for *Fine Woodworking*.

Even a high-quality bench vise will rack a little when a workpiece is clamped on one side and the opposite side is left empty. A common fix is to insert a spacer in the empty side to match the thickness of your stock. But this means you need several spacers of different sizes or an adjustable deck of shims.

Instead, I use a hard-maple wedge to support the open end of the vise. I add a lip that registers it level and keeps it from dropping to the floor. A pair of wedges, one narrow and one thick, will provide support for a wide range of stock thicknesses.

To make the wedges, start with stock that is $1\frac{3}{4}$ in. thick by 8 or 9 in. long. I cut the wedges at the bandsaw, making one that tapers from $1\frac{5}{8}$ in. wide to 1 in., and a second that goes from 1 in. to $\frac{1}{4}$ in. On each, I glued a cap of $\frac{5}{16}$ -in.-thick by 2-in.-wide stock to serve as the lip.

Use a handplane or sander to clean up the sawcuts. Soften the edges, and the wedges are done.

To use, clamp a board in the side of the vise with just enough pressure to keep it from falling. Now push the wedge in as far as it will go and snug up the vise.

—CHRIS GOCHNOUR, Murray, Utah

Insert wedge until it stops, then tighten vise until it is snug.

Wedges taper in thickness. One goes from $1\frac{3}{4}$ in. 1 in.; the other from 1 in. to $\frac{1}{4}$ in.

Lip keeps wedge from falling.

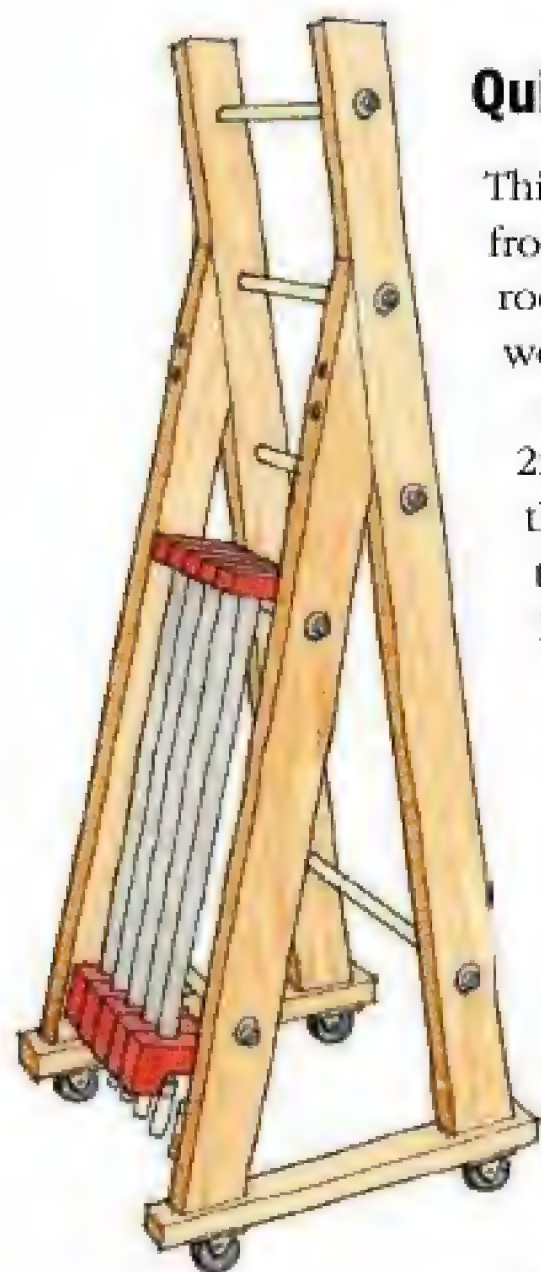
Workpiece

A Reward for the Best Tip

Send your original tips to fwmow@taunton.com or to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470.

We pay \$100 for a published tip with illustrations; \$50 for one without. The prize for this issue's best tip is a Veritas block plane.





Quick and sturdy clamp rack

This angled, rolling clamp rack is made from construction lumber, threaded rod, PVC pipe, and lag screws. It works great and was a breeze to build.

Start by cutting the A frames from 2x4s. Cut the long pieces to 60 in., the short ones to 51 in., and angle their ends as shown in the drawing. Fasten the shorter piece to the longer one with countersunk 3½-in.-long lag screws. Drill these holes on a drill press before angling the tops of the short pieces.

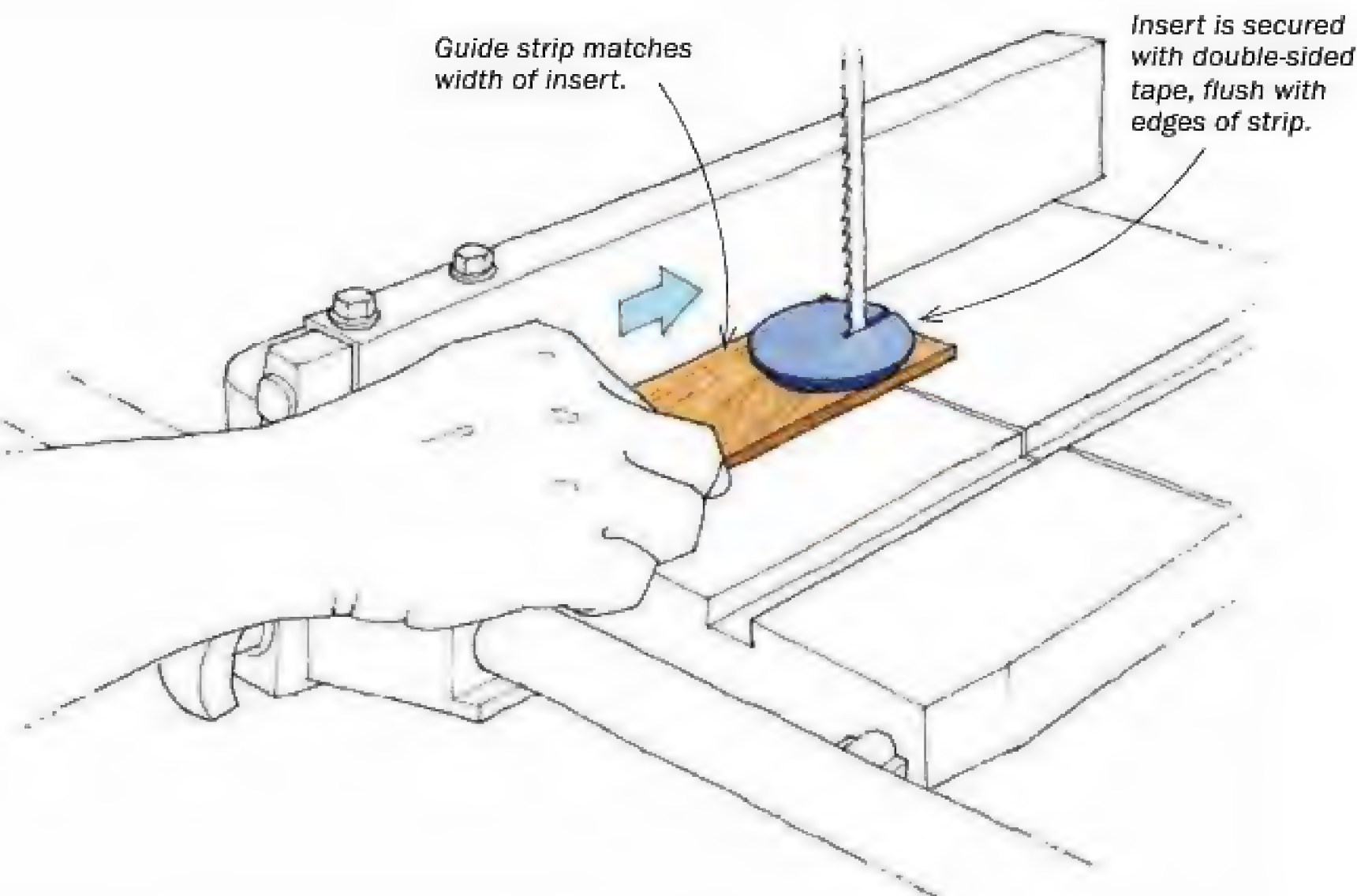
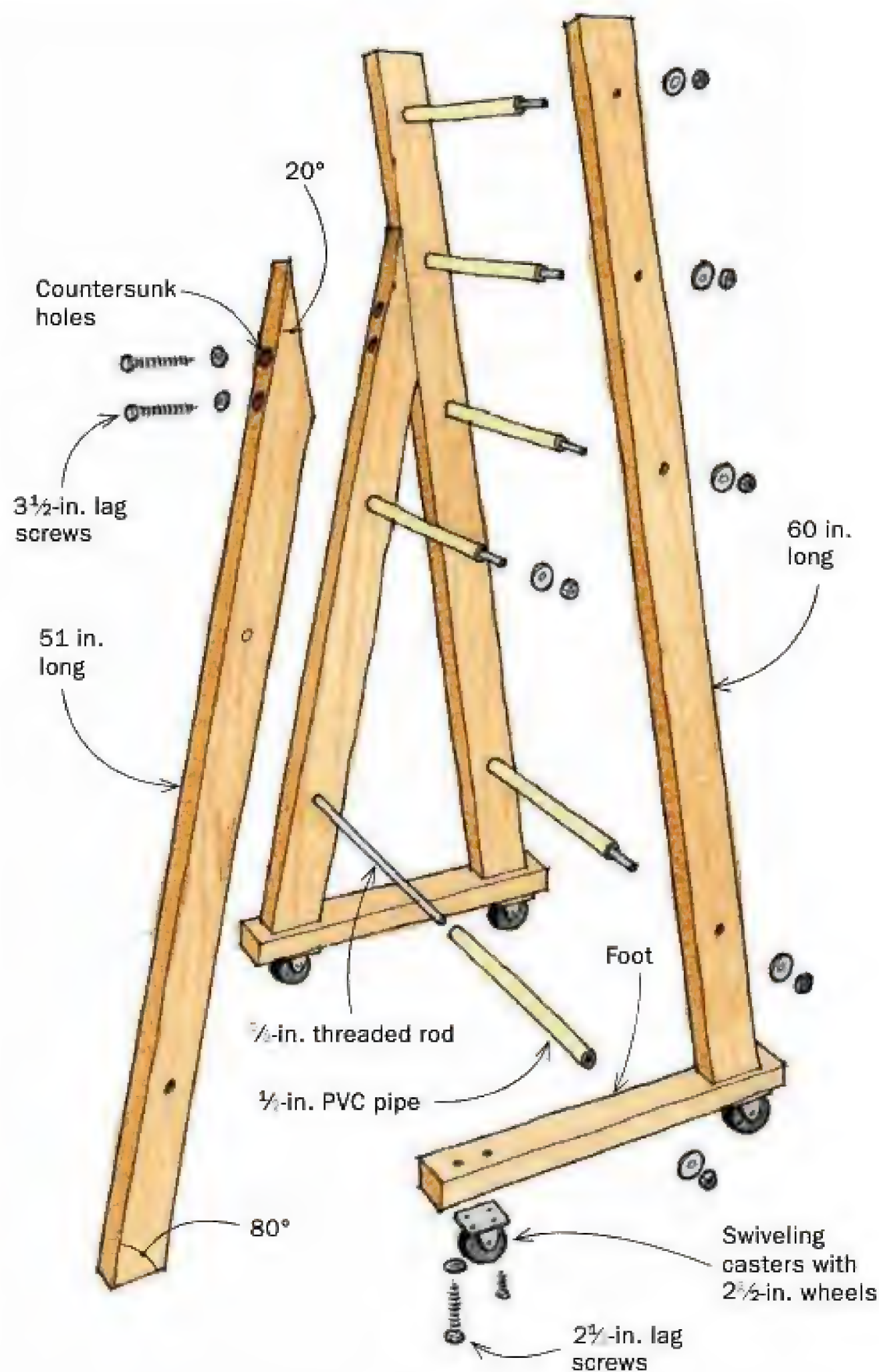
To complete the rack, add a 2x4 foot at each end, securing it with two 2½-in. lag screws driven from the underside. Countersink these to let the casters swing freely.

Attach two swiveling casters to each foot. Make up the clamp

rods with ½-in. threaded rod enclosed in ½-in. schedule 40 PVC pipe. In my rack, the space between the two A-frames is 19 in. (which lets you cut six lengths from a 10-ft. length of PVC).

Set the position of the clamp rods based on the full length of the clamps to be stored on them. Be sure that the handles of the longest clamps clear the floor.

—DOUG CAMPBELL, Asheville, N.C.



Slotting a new bandsaw throat insert

Those blue plastic zero-clearance bandsaw inserts sold by Woodcraft, Rockler, and others are an improvement over the stock inserts that come with the saw. They are made without a blade slot, though, so you have to cut that yourself. Here's how I do it accurately and safely.

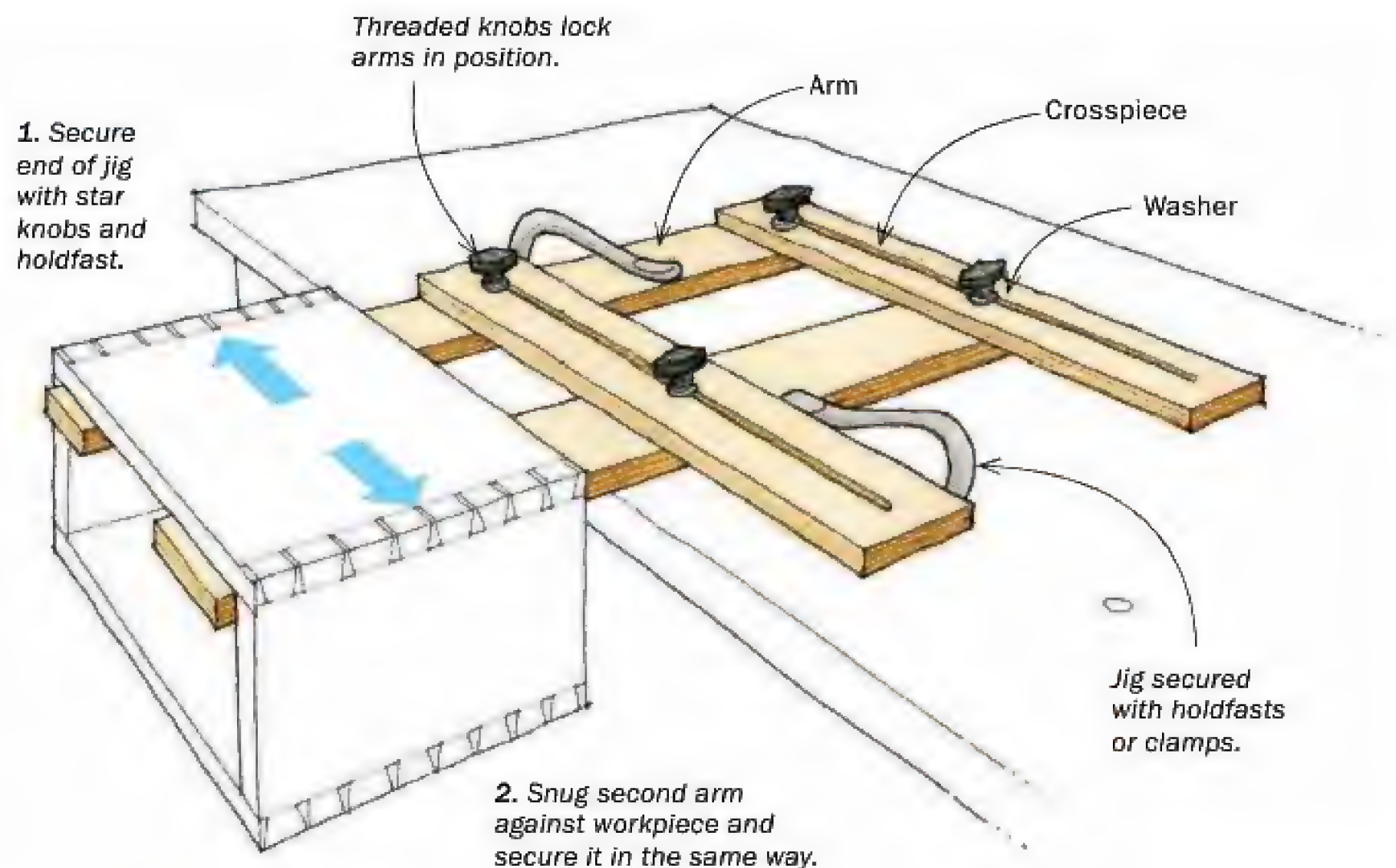
Cut a ¼-in.-thick strip of wood or plywood the same width as the insert and 10 in. or 12 in. long. With double-sided tape, fasten a new insert to the face of the strip at one end, flush on three sides. Now just bring the rip fence up to the edge of the opening in the table. Now you can cut the slot in the insert safely, and in just the right spot. Stop the cut when the insert reaches the back side of the opening and you'll have the depth right, too. Snap the insert into the saw table, and you're ready to go.

—MICHAEL DURBROW, Beaverton, Ore.

Adjustable jig holds drawers, casework for planing

I made this jig to support dovetailed cabinets while I use a handplane to smooth the sides and joinery, but it can also be used to smooth and fit drawers. The jig consists of two arms, two slotted crosspieces, and four threaded knobs. I secure the whole thing to the workbench with holdfasts, but you can use clamps if the arms are long enough. By adjusting the space between the arms and varying the jig's location on the bench, you can support virtually any size drawer. The components of my jig were made from $\frac{5}{8}$ -in. plywood. If you plan to use the jig for heavy and large carcasses, consider doubling the thickness of the arms.

—McKAY SLEIGHT, Orem, Utah



Better jig for shelf-pin holes

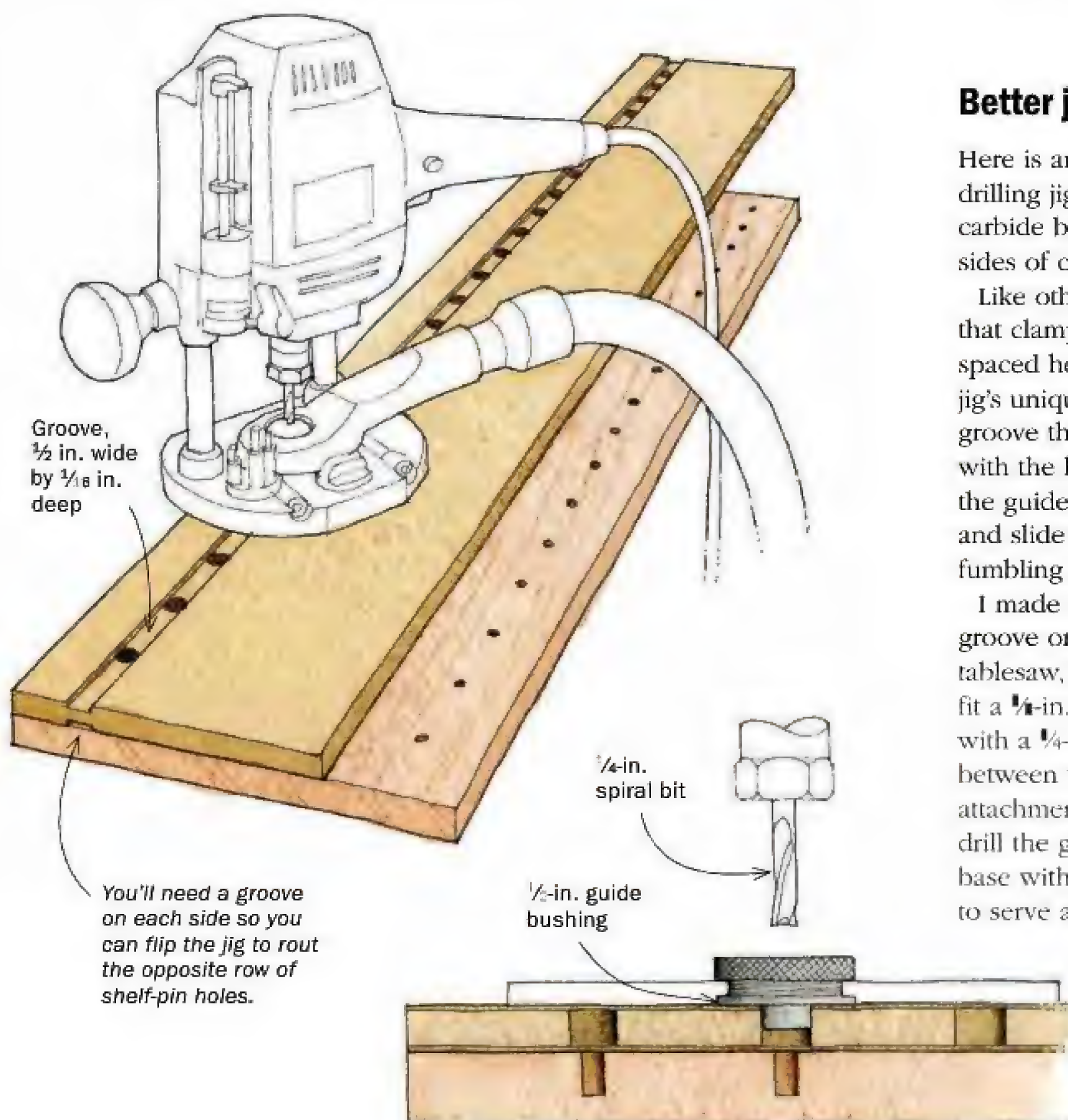
Here is an improvement on the standard shelf-pin drilling jig. It uses a plunge router with a spiral carbide bit to make clean holes for shelf pins in the sides of cabinets.

Like other jigs for this task, this one is a template that clamps to the workpiece, with a line of evenly spaced holes to locate the router for each cut. This jig's unique feature is the $\frac{1}{2}$ -in.-wide by $\frac{1}{16}$ -in.-deep groove that runs the length of the jig exactly in line with the holes. The groove captures the bottom of the guide bushing, letting me lift it from one hole and slide the router to the next hole without any fumbling around to find it.

I made the guide from $\frac{1}{2}$ -in. MDF, cutting the groove on each side with a dado cutter on the tablesaw, and then drilling a series of guide holes to fit a $\frac{1}{4}$ -in. guide bushing. That size bushing combined with a $\frac{1}{4}$ -in.-dia. bit allows enough clearance between the bushing and the bit for the vacuum attachment on my router to clean out the chips. I drill the guide holes on a drill press using a plywood base with a short length of $\frac{1}{4}$ -in. dowel sticking up to serve as an indexing pin for consistent spacing.

Use the groove as a reference when setting up the fence on the drill-press table.

—GERRY TETRAULT, Bristol, Vt.



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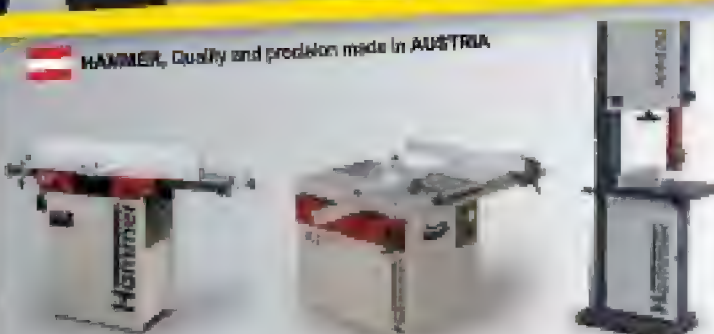
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tools & materials

■ POWER TOOLS

First-rate features on new miter saw

BECAUSE MOST WOODWORKERS already have a tablesaw and crosscut sled for wide stock, they don't need a sliding miter saw. That makes a simple 12-in. chopsaw the best value for quick crosscuts of all kinds, from rough to fine. The new single-bevel, 12-in. miter saw from Bosch stands out from the crowd in a number of ways. The miter detent override button, superb sliding fence, and integral extension wings have been successfully incorporated from earlier Bosch designs. New features include a large, readily accessible bevel-lock lever that's a pleasure to use. The new trigger lock is also a big improvement.

Ultimate Trim Bits by Whiteside

Pattern bit, \$150; flush, \$140; combination, \$150
woodcraft.com

The lock buttons are located on the underside of the D-handle, which yields a more natural grip and much improved control over the saw head.

The CM-12 arrived in perfect alignment and it cut smoothly and



Make way for the blade. To change the blade, you must remove the outer chip deflector. Don't forget to put it back on when you're done.

12-in. Miter Saw by Bosch

Model CM-12
\$340
amazon.com

accurately throughout my testing. It has excellent capacity for a fixed-head saw: an 8-in. maximum crosscut and a vertical reach of

6 3/4 in. for cutting stock on edge. Dust

collection is so-so, but that's not a surprise on a miter saw. Space for blade changes is a bit tight, and it's challenging to remove and install the blade, in particular standard-kerf models. But the problem is easily solved by removing the outer chip deflector before you change blades.

The Bosch CM-12 offers great accuracy, big capacity, and convenient features, making it a solid buy for the home shop.

—Andy Beasley has a home shop in Colorado Springs.

■ POWER TOOLS

Shear-cutting trim bits leave silky surfaces

WHEN I FIRST SAW WHITESIDE'S ULTIMATE line of trim bits, I couldn't wait to get my hands on them. These 3/4-in. shank, solid-carbide router bits utilize a high-angle, shear-cutting action with a compression effect that pulls material toward the center of the cut, reducing tearout on both edges at once. There are three versions: flush, with the bearing on top; pattern, with the bearing on the bottom; and combination, with bearings on top and bottom. I used the bits on a variety of materials, from hardwoods to Baltic-birch plywood, and even super-dense solid surface material. The results were spectacular! The bits leave a crisp, clean surface with no fuzz.

The bits are only 1 1/4 in. long, which is fine for most projects. But for thicker parts you'll have to make additional passes at a different depth. It would be incredibly handy to have a bit length of 1 1/2 in. to 2 in.

Also, the 7/8-in.-dia. bits have to be run slowly (Whiteside recommends no faster than 18,000 rpm.)

These bits are expensive—about double the price of other 3/4-in.-shank solid-carbide spiral flush-trimming bits. But for me, the results are worth it, as the bits save me the time and labor needed to smooth routed edges. Whiteside's Ultimate Trim Bits have earned a spot in my must-have router bit category.

—Gregory Paolini operates a busy woodworking shop and school near Asheville, N.C.



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■ HAND TOOLS

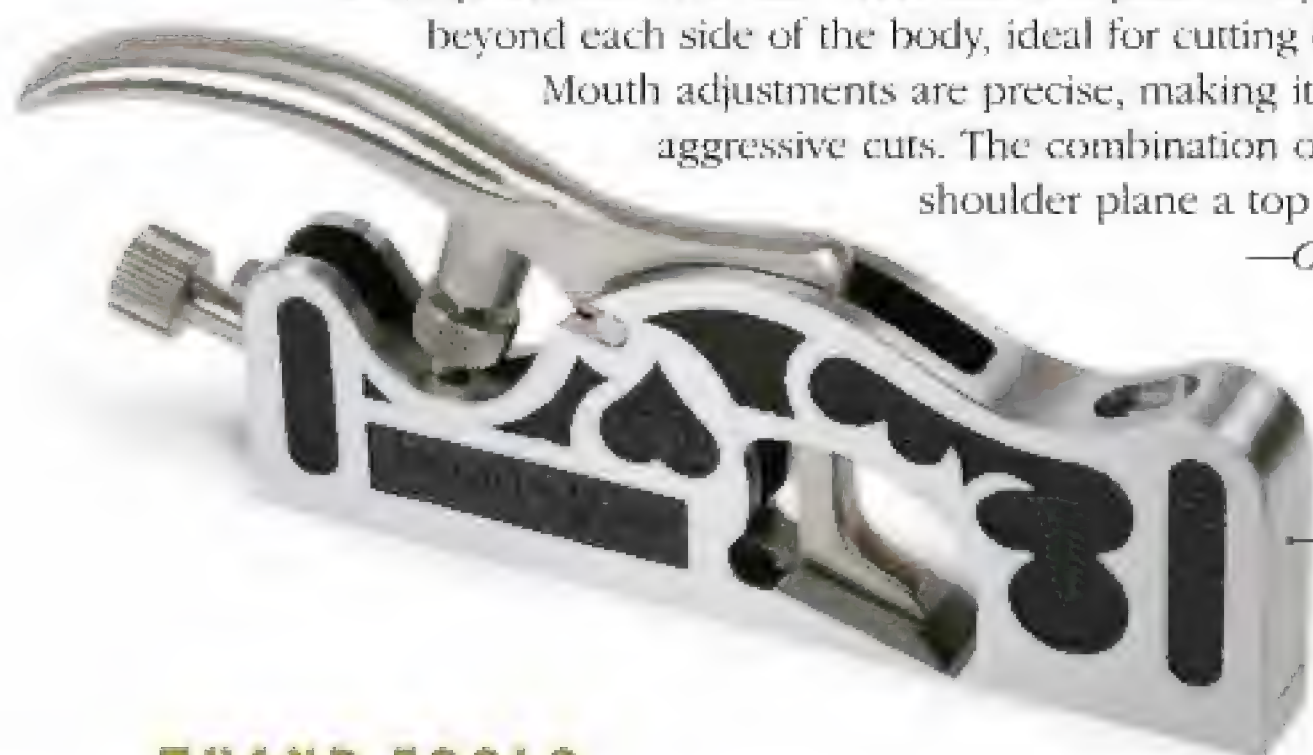
Shoulder plane pairs classic styling with solid performance

WOOD RIVER'S MEDIUM SHOULDER PLANE (No. 92) traces its lineage back to iron shoulder planes that Edward Preston manufactured around the turn of the 20th century. But Wood River didn't just reproduce the Preston models. They made them better by redesigning the blade-adjustment mechanisms to eliminate lateral slop when the blade is moved forward or back—a real plus for this trimming tool.

Out of the box, the plane is well made, with unique and beautiful details cast and machined without any burrs or sharp edges. The 5/4-in.-wide by 8 5/8-in.-long plane feels solid and comfortable in the hand. The sole was dead-flat and the sides were accurately square to the sole, an important characteristic for trimming tenon shoulders. The blade is flat, square, and 0.006 in. wider than the plane body, allowing it to project 0.003 in. beyond each side of the body, ideal for cutting clean, square corners.

Mouth adjustments are precise, making it easy to dial in the tool for fine or aggressive cuts. The combination of aesthetics and quality makes this shoulder plane a top performer at a very attractive price.

—Chris Gochnour is a furniture maker and hand-tool expert.



Medium Shoulder Plane
by Wood River

\$150
woodcraft.com

■ HAND TOOLS

Durable diamond plates work fast



Diamond plates by Atoma

\$99 to \$109
depending on grit
leevalley.com

FOR RAPID STOCK REMOVAL, IT'S HARD TO BEAT DIAMOND PLATES. And the Japanese-made Atoma diamond plates are some of the best I've used. They come in three different grits: 140, 400, and 1,200. Each plate is dead-flat, with symmetrically organized diamond clusters that cut extremely fast while promising to reduce diamond fracture and breakdown, which helps durability. The 140-grit plate is ideal for forming a bevel or correcting a chipped edge; the 400-grit plate is great for lapping waterstones and blade backs; and the 1,200-grit plate is ideal for refining a lapped surface and preparing an edge for final polish. The Atoma stones achieve the rare triple play in sharpening equipment: fast, flat, and durable.

—C.G.

Laser Kerf Saw Blade by Infinity Tools

\$180
infinitytools.com



■ POWER TOOLS

Thin blade cuts with minimal waste

INFINITY'S NEW THIN-KERF BLADE helps you get the most out of your prized woods, as it cuts a tiny (1/16-in.) kerf and leaves virtually no tearout. The 40-tooth ATB negative-hook blade is surprisingly rigid and stable, thanks to a thick, built-in blade stiffener. But the stiffener makes it impossible to use a riving knife because it offsets the blade plate away from the inner arbor flange, so you'll need to add a wafer-thin splitter to your tablesaw insert (Infinity sells a special splitter for \$20). The stiffener also limits the cutting depth to 2 in. These issues aren't large obstacles, because this isn't a general-purpose blade. Instead, it's a high-end specialty cutter made to reduce waste when cutting expensive stock. It's also great for narrow or thin stock that would get chewed up by a standard-kerf blade, making it ideal for cutting inlays, stacks of veneer, and even delicate moldings.

—Roland Johnson is a contributing editor and tool enthusiast.

New system makes stringing easy

FEDERAL PERIOD FURNITURE features delicate, contrasting stringing, a detail that is beautiful in more contemporary work too. But anyone contemplating such projects is faced with the practical problem of how to execute smooth arcs, circles, and straightaway grooves to accept the stringing. Furniture makers use a variety of tools, usually shopmade, and the process demands extreme care and patience. Then you have to make the stringing to fit, thin and uniform.

To make this beautiful work much easier, Veritas has designed and produced a neat set of tools. The basic string inlay tool features a cutterhead, a fence, and two blades—one for cutting the groove, and one for slicing inlay material. You also can buy the basic setup with a compass tool and/or pencil holder, which is the kit I tested.

The various parts of the system can be configured to perform a range of tasks, from design and layout to cutting grooves and slicing veneer for stringing. This is a quality tool that was carefully designed and put together. I found it very easy to assemble and set up; and the required adjustments were easy to perform.

For straight inlay, say along a leg or table edge, the tool works like a marking gauge. Adjust the cutter to the required distance from the fence (up to $3\frac{1}{4}$ in.) and at its maximum projection, and start cutting. The cutter is designed to score the edges of the groove in one direction and excavate the middle in the other. The tool delivers clean grooves, even across the grain. Although you can limit the depth of cut by controlling the cutter's projection, I found it easier simply to use the maximum projection and gauge the depth by eye.

For curves, you replace the fence with the compass center and use the pencil holder to first mark the layout, then install the cutter to cut the groove, using the same push-pull motion. Last, you combine the slicing blade with the fence to cut inlay strips easily and accurately.

There's a learning curve with this tool, and I'd recommend practicing with it on scrap stock before using it on your project. Straight grooves are no problem, but using the tool on curves requires a bit more "driving experience." After a practice session, all of my grooves turned out crisp, without tearout, and sufficiently deep to receive stringing without extra work. With this tool, you'll be installing period-perfect stringing in no time.

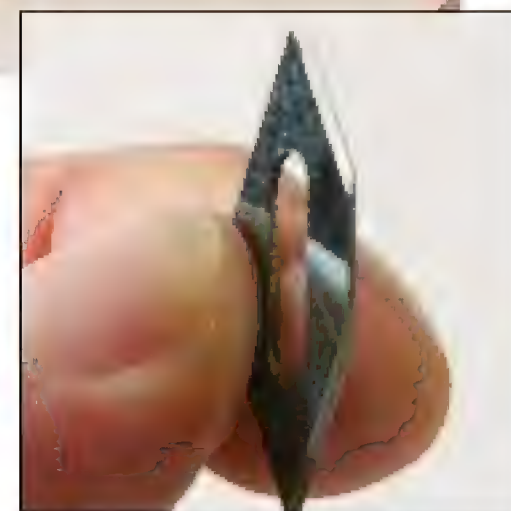
—Mario Rodriguez helps run
the Philadelphia Furniture
Workshop.



And perfect slots. The toothed blade excavates a consistently sized groove.



Cuts clean strips. Insert the stringing cutter, and you can slice your own stringing. The fence makes it easy to cut consistent widths.



String Inlay Tool by Veritas

As tested, with
compass center
and pencil holder:
\$129

leevalley.com

Curves, too. The compass center slides onto the bars to create curved grooves.



Gear up for glue-ups

KEEP THE RIGHT STUFF ON HAND AND GET BETTER RESULTS

BY MICHAEL FORTUNE



As I say in “Great Glue-Ups, Guaranteed” (p. 44), glue is a slippery film. And as you’ll see in that article, I use a few types of clamps and a wide variety of cauls to put pressure right where I want it and to keep parts in place. That article covers a variety of specific situations; this one covers the glue-up gear I keep on hand. The beauty of these basic cauls and supplies is that they will handle the vast majority of work you will encounter.

I use common types of clamps. Instead of spending your money on a pricey parallel-jaw models, buy more of the low-tech kind. Then spend your time making cauls. I use a bunch of custom cauls in my work, made from whatever hardwood I can spare, but I keep a variety of common sizes in buckets.

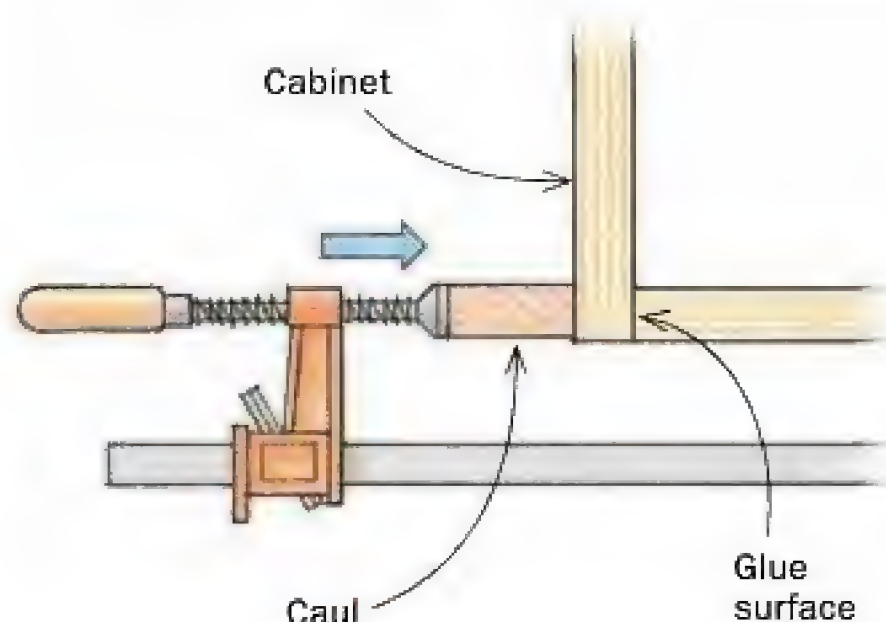
When clamping pieces that are prefinished or will be hard to sand or repair later, I use small pads under the clamp heads. If the jaws don’t have pads already, I tape pieces of wood to the workpiece. You don’t want to be wrestling with little wood pads as you try to position the clamps perfectly and tighten them. I keep a pile of these pads on hand, made from basswood and poplar—softer than the furniture woods I use but strong enough to stand up to the pressure. As for glue, some people pour it into little dishes before spreading it, but I almost always apply it right out of the bottle, and I use my finger, wiping it clean on one of the world’s crustiest aprons.

Michael Fortune is a contributing editor.

How clamps and cauls team up

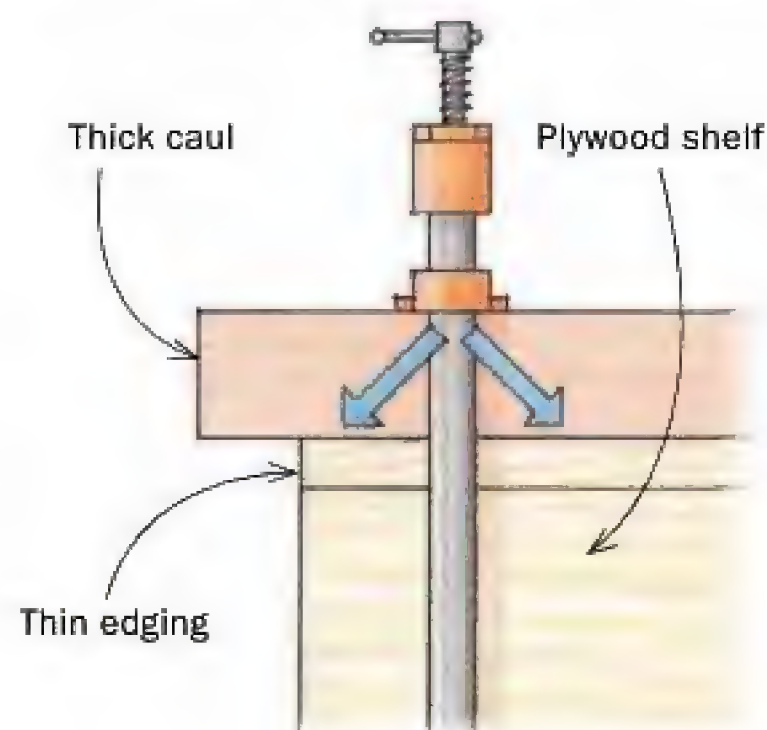
DIRECT

Pressure needs to be centered on a joint, so Fortune prefers clamps that focus their force. Cauls add insurance.



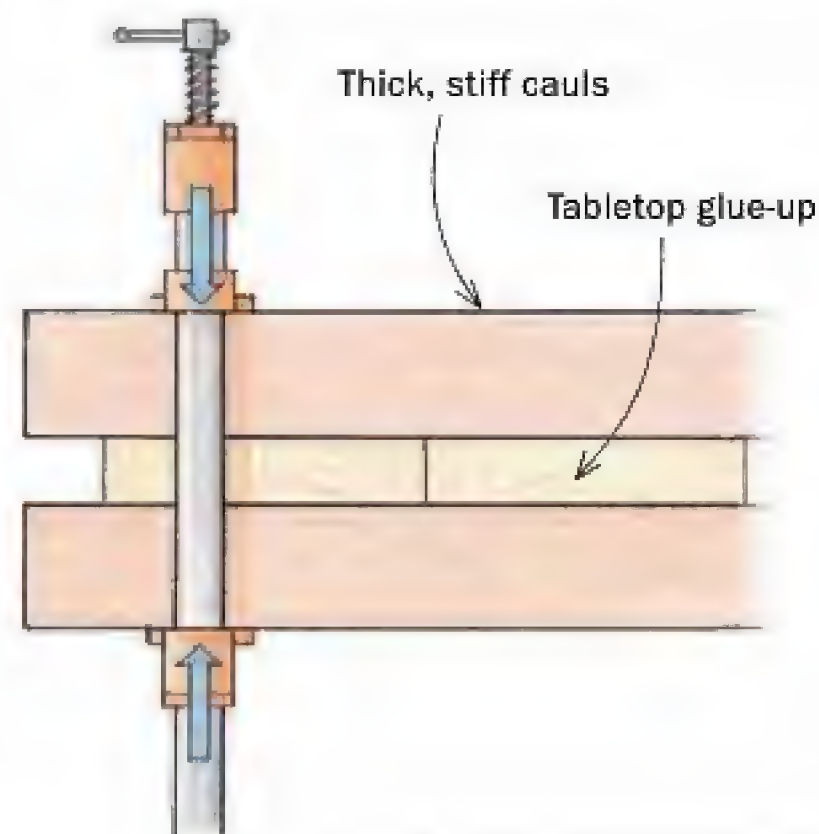
SPREAD

Just as pressure needs to be centered in one direction, it often needs to be spread in the other. Cauls handle that, too.



CONSTRAIN

Even if the pressure is centered, pieces can shift. Cauls keep them perfectly in line.





Pipe clamps

There is no better and more affordable way to reach long distances than with pipe clamps, in both the $\frac{3}{4}$ -in. and $\frac{1}{2}$ -in. sizes. The larger ones are stronger; the smaller, more nimble.

He sometimes uses plastic jaw protectors (available online) on these.

Clamps

Fortune keeps a wide variety of clamps on hand, and none are high-tech. His favorites are Jorgensen F-style bar clamps, because you can align the deep clamp heads precisely on almost any joint. When F-clamps fall short, he turns to Jorgensen pipe clamps. He finds parallel-jaw clamps to be heavy and imprecise.

F-style clamps

Fortune has Jorgensen F-style bar clamps in many sizes and lengths, and most have little plastic jaw protectors.



Edge clamps

Although he could get by without them, Fortune really likes these specialty clamps (Grip 32106 Small Edge Clamps, \$20 each at ToolKing.com).

Targeted pressure. With edge clamps, you don't need to reach long clamps across a panel. You still need a caul, though.



Accessories

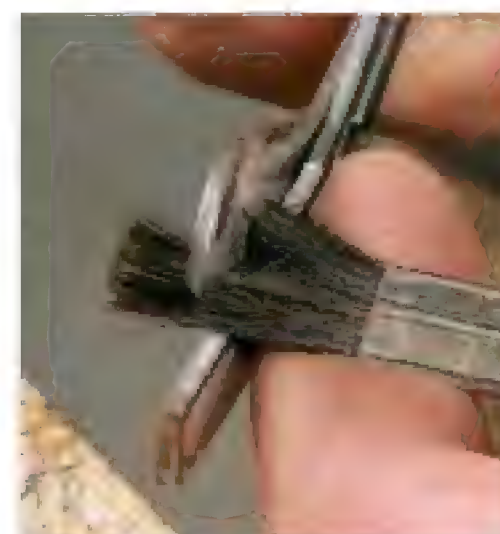
You can keep it simple with the glue, too. Simple PVA (yellow) glues are super-strong, and the best spreader is your finger, though Fortune also uses cheap brushes and sticks.

Glue

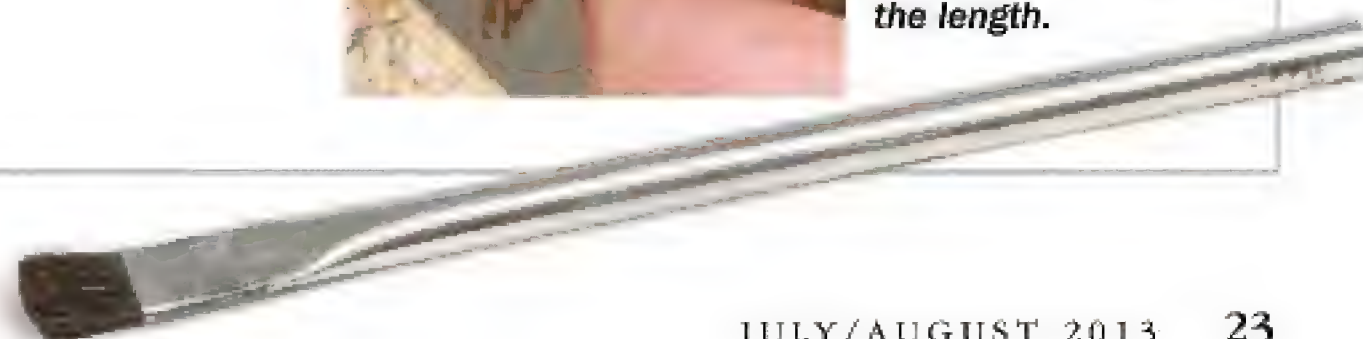
Fortune almost always uses Titebond III, which has 20 to 25 minutes of working time. It leaves a tan glueline, so for the whitest woods he uses Titebond I, which sets up a bit faster.

Spreaders

To get glue into crannies like mortises and dovetails, Fortune uses popsicle sticks, trimmed square, and cheap brushes, which he takes a moment to fine-tune.



Brush trick. As is, cheap flux brushes are too floppy and tend to drop bristles into the glue. So hammer the ferrule to tighten up the bristles, and trim off some of the length.



Cauls

Fortune keeps a few types of hardwood cauls in buckets, always ready to go. He prefers to use packing tape to prevent glue from sticking, but for two-sided cauls with one edge curved and one straight, he waxes both faces,

as clamps would tear up the tape. A marker line, straight or curvy, shows which face goes against the glue-up.



How to make a curved caul



Simple setup. Mark the midpoint of the caul, and set up a stop block on the jointer so that point will drop right at the leading edge of the outfeed table. Set the jointer for a $\frac{1}{8}$ -in.-deep cut.



Drop and go. Put the caul against the stop block with a push stick hooked on that end, and lower the caul onto the cutterhead. Then push it forward. Do the same to the other end to create a gentle camber.



$\frac{1}{8}$ in. is enough camber for an 18-in.-long hardwood caul.



Long and strong

In one bucket, Fortune keeps long cauls for larger glue-ups. These are roughly $\frac{7}{8}$ in. thick by $1\frac{3}{4}$ in. wide by 18 in. long. Several are slightly cambered so when clamps are applied at the ends, pressure is exerted in the middle.

Short and flat

In the other bucket, he keeps 20 short cauls, each roughly $\frac{7}{8}$ in. by $1\frac{1}{2}$ in. by 6 in. long. He uses most of them flat side down, where they have more surface area and are more stable. That said, half have their packing tape wrapped around the edge. He uses them that way for the added stiffness and better visibility.

TIP

KEEP GLUE FROM STICKING



Tape or wax. The tape lasts indefinitely, but the paste wax needs to be refreshed from time to time.





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You need a cabinet scraper

IT'S THE BEST TOOL FOR CLEANING UP TEAROUT BEFORE FINAL SMOOTHING. HERE'S HOW TO SET IT UP PERFECTLY

BY PHILIP C. LOWE

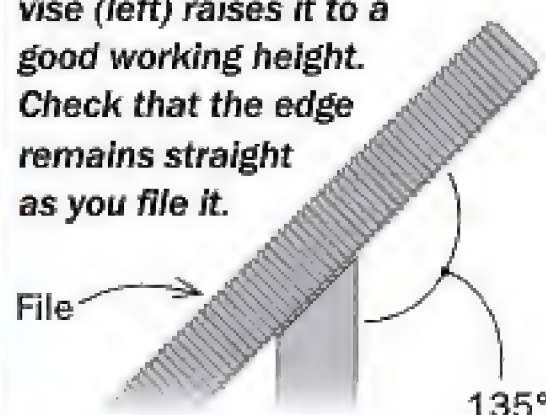


1. File and hone the bevel

A good hook starts with fresh steel and a polished bevel. Repeat this process every time you turn the hook, as using the scraper hardens the edge too much to allow you to re-turn it.



File the edge. Use a 10-in. mill bastard file to expose fresh steel. Clamping the blade in a hand screw clamped in your bench vise (left) raises it to a good working height. Check that the edge remains straight as you file it.



Hone the bevel freehand. The blade is too big for a guide. To maintain the bevel angle, lock your elbows against your body and rock your legs forward and back.

Unlike the more familiar card scraper, the cabinet scraper is not made to leave a finished surface. Instead, it's a rougher tool, used to remove tearout and machining marks created by the jointer and planer and tracks left by handplanes before you begin final surface preparations with sandpaper and a card scraper.

It's a bit of a quirky tool. Although the blade looks like a card scraper and cuts with a hook, it's a bit thicker and mounted in a body similar to that of a spokeshave. But the sole is larger than a spokeshave's. This bigger sole prevents you from creating a divot—which can happen with a card scraper if you concentrate too much on any one spot—because it forces you to work a larger area of the surface.

A cabinet scraper does a great job if set up properly. I'll show you how to sharpen the blade and how to set it to take nice shavings. I'll also give you a few tips for using it and for correcting some common problems.

Hook the blade

Although the cabinet scraper's blade is beveled (45°), it actually cuts with a hook turned onto the cutting edge.

After filing the bevel to expose fresh steel, hone the bevel and polish the back on your sharpening stones. I work my way through four grits—1,000, 5,000, 8,000, and 16,000—but you could use

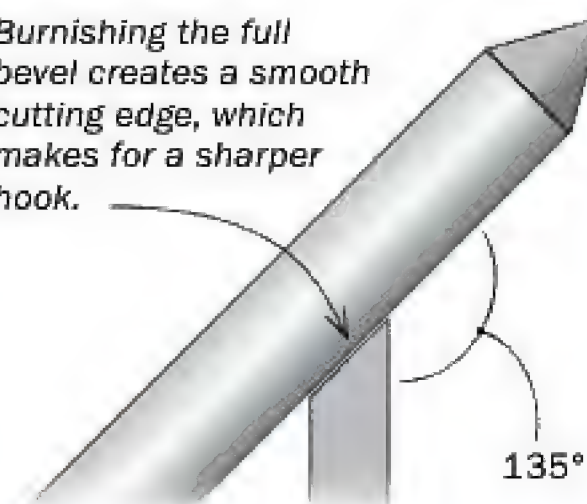
2. Roll the hook

Get a strong hook by forming it slowly, rolling it a bit more with each stroke.



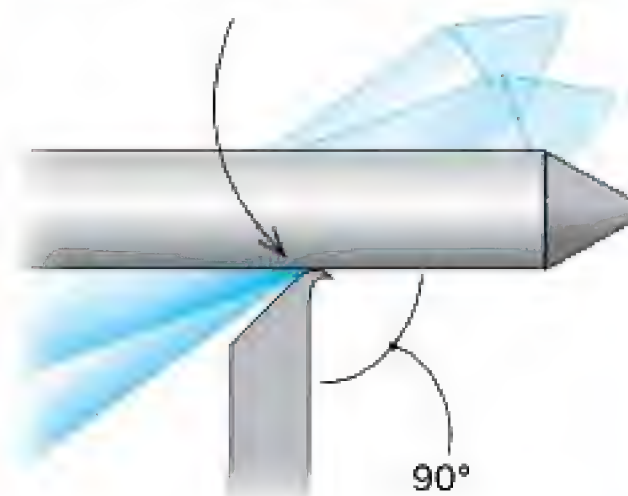
Burnish the entire bevel. Take several strokes back and forth across the bevel to flatten any scratches that might remain after honing.

Burnishing the full bevel creates a smooth cutting edge, which makes for a sharper hook.



Work the hook. Take several strokes, raising the burnisher 5° to 10° with each stroke, taking the final stroke with the burnisher 90° to the blade.

Raising the angle of the burnisher with each pass actually rolls the hook, rather than simply pushing it down. That makes the hook stronger.

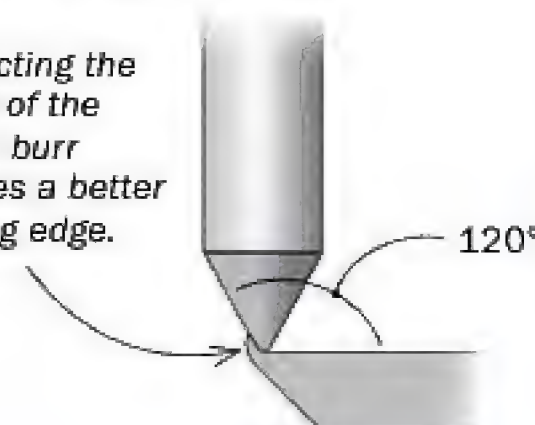


Don't forget the back. Polish it to the same level that you polish the bevel. Lowe works the bevel and back before moving to the next stone.



Now fine-tune the hook's angle. It's fairly easy to roll the hook too far or to roll it at an inconsistent angle. To fix this, you need a burnisher with a pointed tip. Run the tip along the hook, which brings it to a consistent 120° angle, perfect for scraping.

Correcting the angle of the entire burr creates a better cutting edge.

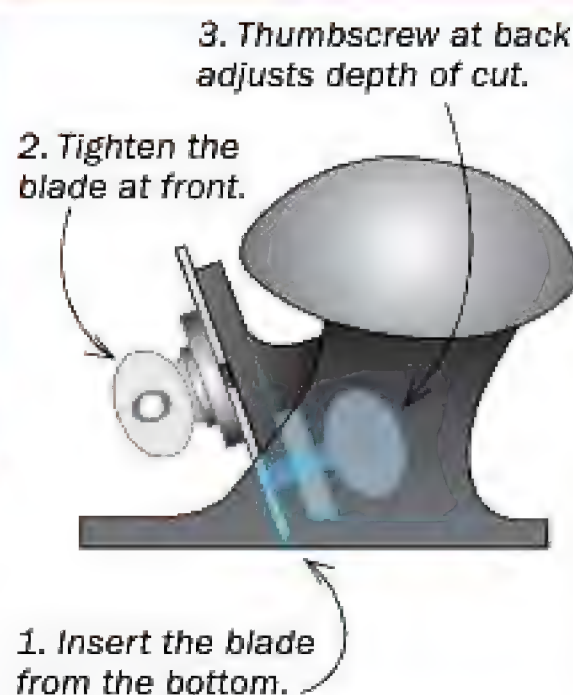


3. Set up for fluffy shavings

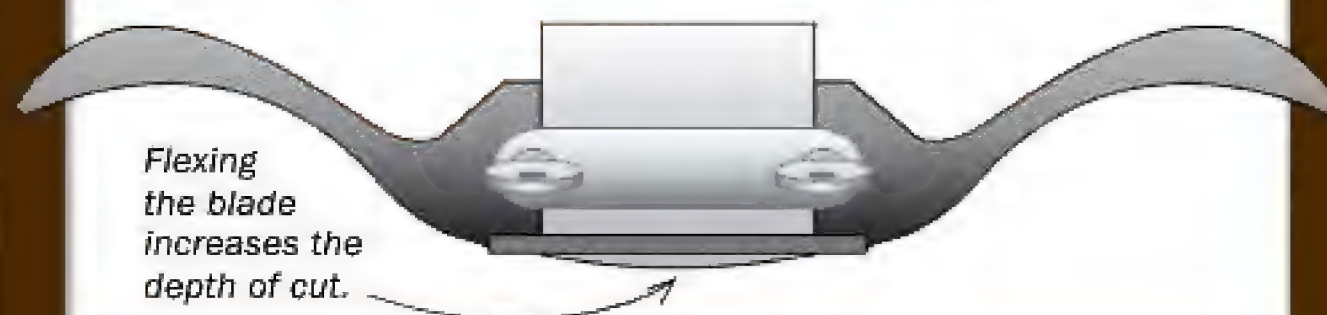
Insert the blade into the scraper body from beneath, with the hook facing toward the depth-adjustment thumbscrew.



Clamp the blade in place. With the scraper on your bench, press down on the blade so it's bottoming out on the bench. Tighten both screws evenly.



Set the depth of cut. Turning the thumbscrew clockwise flexes the blade and increases the depth of cut. However, the greater the blade's flex, the narrower the cut, so go easy and take wide, fluffy shavings unless the tearout or machine marks are deep.



similar grits and just go through 8,000.

Now you can turn the hook. Hold the burnisher at 45° and burnish the bevel to remove and flatten out any remaining scratches. Next, take several strokes along the cutting edge, raising the burnisher with each stroke until it is square to the blade.

After turning the hook, I lay the blade flat on my bench with the hook facing up and run the tip of my burnisher along the hook. The tip is shaped like a cone, and adjusts the hook to a consistent angle, improving its cutting ability (You can buy a burnisher like this from Lowe for \$65 at furnituremakingclasses.com).

The blade is ready to cut shavings now, so put it back in. Tighten the clamping bar, and set the cut depth with the thumbscrew.

Scrape before cutting parts to size

As you scrape, apply even downward pressure with both hands and be sure not to scrape more from one area than others. Also, hold the tool at a slight angle to prevent the blade from grabbing and catching, especially near the corners. I push the scraper, but it can be pulled.

Work from the ends in toward the center, because if you scrape down the length of the part, there is a good chance the blade will catch at the far end, leaving a crease that is difficult to remove. You'll end up scraping against the grain on part of the board, which

will lift the grain and leave a rougher surface than scraping with the grain. But that's OK. The cabinet scraper isn't meant to produce a finished surface and you'll be smoothing afterward.

However, because the plane's sole doesn't get a lot of support at the start of the cut, you might not get a great surface there. To avoid this problem, scrape parts before you cut them to their final dimensions. You can cut away any bad surfaces around the ends afterward.

Blade chatter can be caused by uneven pressure from the clamping bar or roughness on the surface of the bar that clamps against the blade. Use a mill file to smooth it, and adjust the thumbscrews to even out the pressure. □

Phil Lowe is a professional furniture maker and teacher in Beverly, Mass.



Works great on difficult woods. Because of its cutting angle, the cabinet scraper cleans up figured woods, eliminating the tearout left by machines and handplanes.

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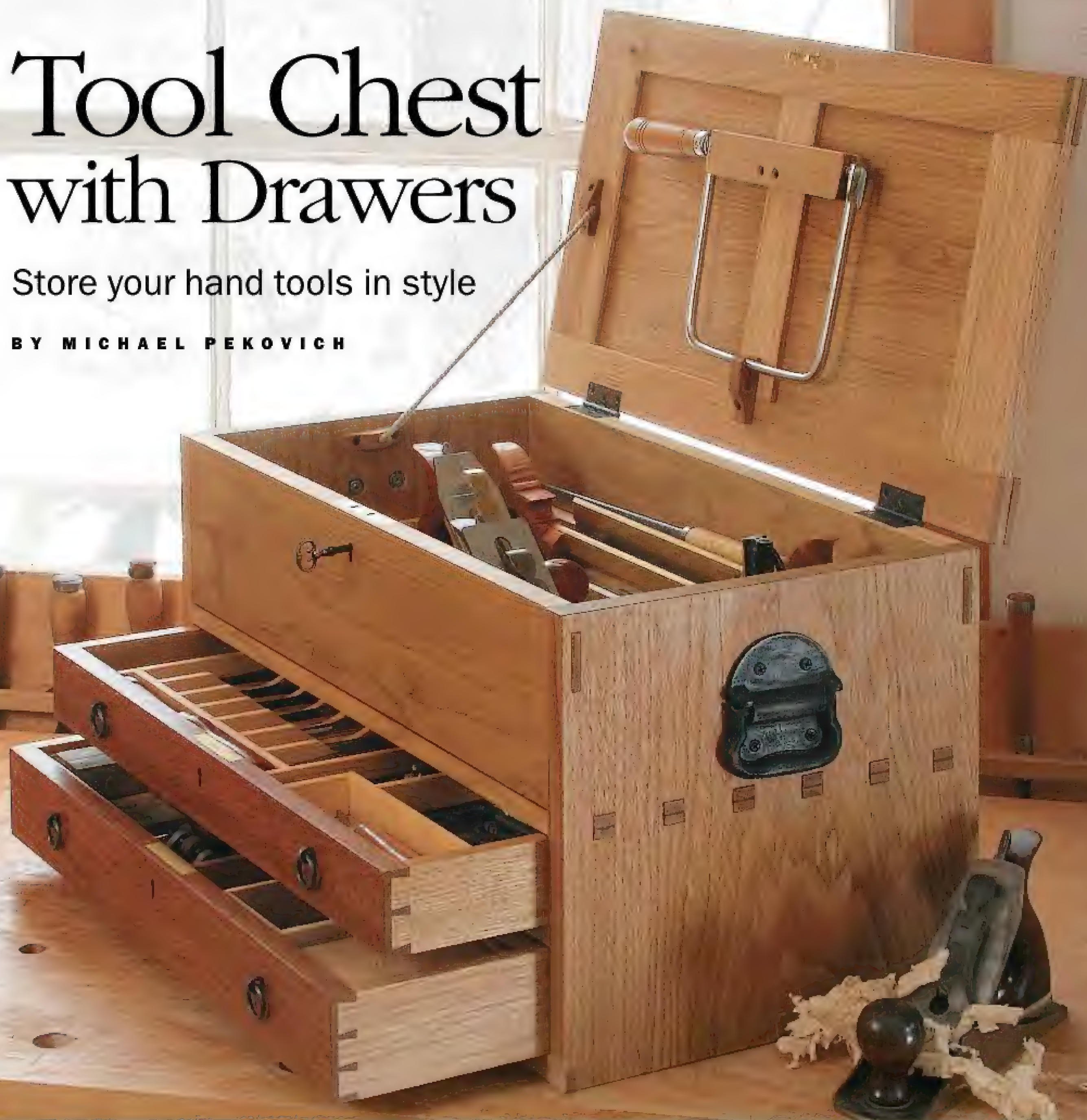


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Tool Chest with Drawers

Store your hand tools in style

BY MICHAEL PEKOVICH



I teach woodworking on a regular basis, and I invariably would stuff hand tools into a canvas tote to take along with me. While convenient, the tote didn't offer much protection in transit or easy access once I was at school. So I finally got around to making a traveling tool box that not only holds my tools more

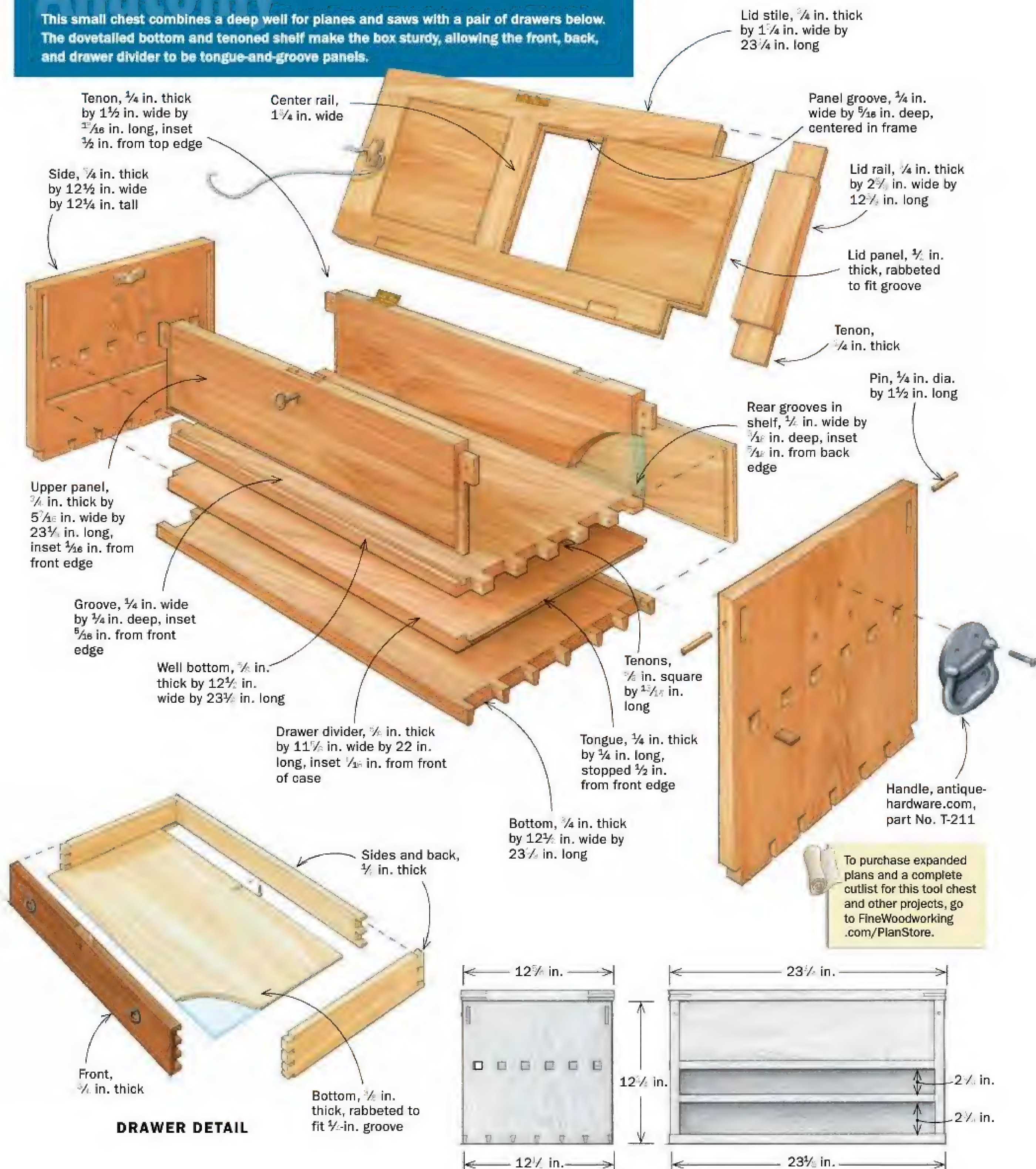
securely but also lets me get at them when I need them.

You don't need to be an itinerant woodworker to make good use of this chest. While a wall-hung tool cabinet like the one I made for a recent Video Workshop might offer more storage, it also requires dedicated wall space. If you haven't set up

a permanent shop yet and need to stow your tools on occasion, a tool chest makes sense. This small case will house your essential hand-tool collection, keep it close at hand on a benchtop or countertop, and tuck away just as easily. Another reason I like it is that it has forced me to think about which hand tools I really need. For

Anatomy

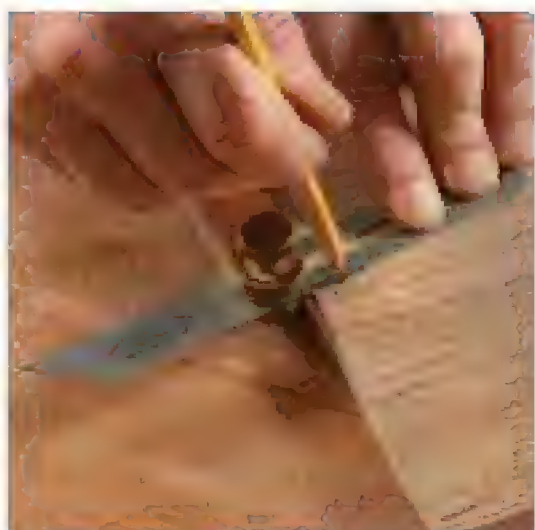
This small chest combines a deep well for planes and saws with a pair of drawers below. The dovetailed bottom and tenoned shelf make the box sturdy, allowing the front, back, and drawer divider to be tongue-and-groove panels.



To purchase expanded plans and a complete cutlist for this tool chest and other projects, go to FineWoodworking.com/PlanStore.

Box

DOVETAILS AT THE CORNERS



Tails first, of course. After scribing the baselines with a marking gauge, lay out the tails with a bevel gauge set to a 1:8 slope (left). Saw to the baseline with a backsaw (right). Don't worry about following your pencil line precisely; you'll scribe the pins to fit later. Just keep your sawcuts square and try not to go past the baseline.



Remove the waste. Use a coping saw to remove most of the material (above). This makes chopping faster and keeps your chisels sharper longer. Then chop to the baseline, taking thin cuts (right). Angle the chisel slightly and work in from each face to create an undercut shoulder. This ensures that the joint will come together tightly.



more on that, check out my free video at FineWoodworking.com/extras.

I studied quite a few classic tool chests as I designed this one. I went with a well deep enough to store handplanes and backsaws up top, and drawers below that allow easy access to chisels and layout tools.

To keep the weight down, I made the case from butternut. It's as light as pine but a lot prettier. Another thing I love about butternut is how it works with hand tools. It dents easily, so be sure to keep your work surface clean and chip-free. It also has a tendency to be a little fuzzy, but a sharp handplane leaves a glass-smooth surface and brings out the luster in the wood.

The case joinery looks impressive but is pretty simple. The sides attach to the bottom with hand-cut through-dovetails, and the well bottom is attached with through-tenons, also hand-cut. I like to leave this type of joinery a little proud to add interest. The rest of the case joinery is mostly routed grooves and rabbeted panels. I built the frame-and-panel lid with tenons and bridle joints that I cut quickly and easily at the tablesaw, though you could do them with hand tools, too.

Tips for hand-cut dovetails

Begin by dovetailing the bottom to the sides. The tails are flush with the bottom of

Scribe the pins for a perfect fit. Clamp each pin board in a vise, level with the top of a scrap board. Raising the tail board lets you focus your pressure in its center, which will ensure accuracy by keeping it motionless. Another key here is to use a marking knife, not a pencil. Carry the lines onto the faces, and then saw, chop, and pare the pins to fit.



THROUGH-TENONS CONNECT THE SHELF



Layout tip for old eyes. Wood grain can make scribed lines tough to see, so Pekovich puts painter's tape on each face before marking the mortises. Use a marking gauge to scribe both the mortises on the sides (1) and the tenons on the shelf. Then use a square and marking knife to scribe the top and bottom edge of the mortises (2). Peeling away the tape provides a clear border for drilling out the waste and chopping the mortises square (3). Work inward from both faces.



the case, but the pins extend past the sides a bit. This requires two marking-gauge settings for the baselines. Set the gauge to the thickness of the stock and mark the case sides. Increase the gauge distance by $\frac{1}{16}$ in. to scribe the case bottom.

This is a good time to scribe the shoulders of the other case parts as well. It's a great trick I picked up from period furniture maker extraordinaire Steve Latta. When you have a lot of parts with the same shoulder-to-shoulder dimension, cut them all to the same length even if the final lengths of the parts will differ. That way you can scribe all the parts with the same gauge setting. Later you can cut them to final length, knowing the case will turn out square. So go ahead and scribe the shoulders on the well bottom, drawer divider, and front and back panels.

Now back to dovetailing. Set a bevel gauge to a 1:8 slope and lay out evenly spaced tails with a half-pin at each end. Use a backsaw to cut the tails. Don't worry about nailing your line. The exact shape of the tails doesn't really matter because you'll be scribing the pins directly from them. Think of these cuts as a warm-up for the pin cuts. Those are the ones that count.

Use a coping saw to remove the waste between tails and clean up the corners with a chisel (see opposite page). Now



Chamfer and kerf the tenons. Saw the tenons like the dovetail pins. Before glue-up, use a block plane to lightly chamfer the ends (above) and then cut slots for wedges using a backsaw. Working from each end, saw an outside tenon and then use it as a guide for the adjacent ones (right).

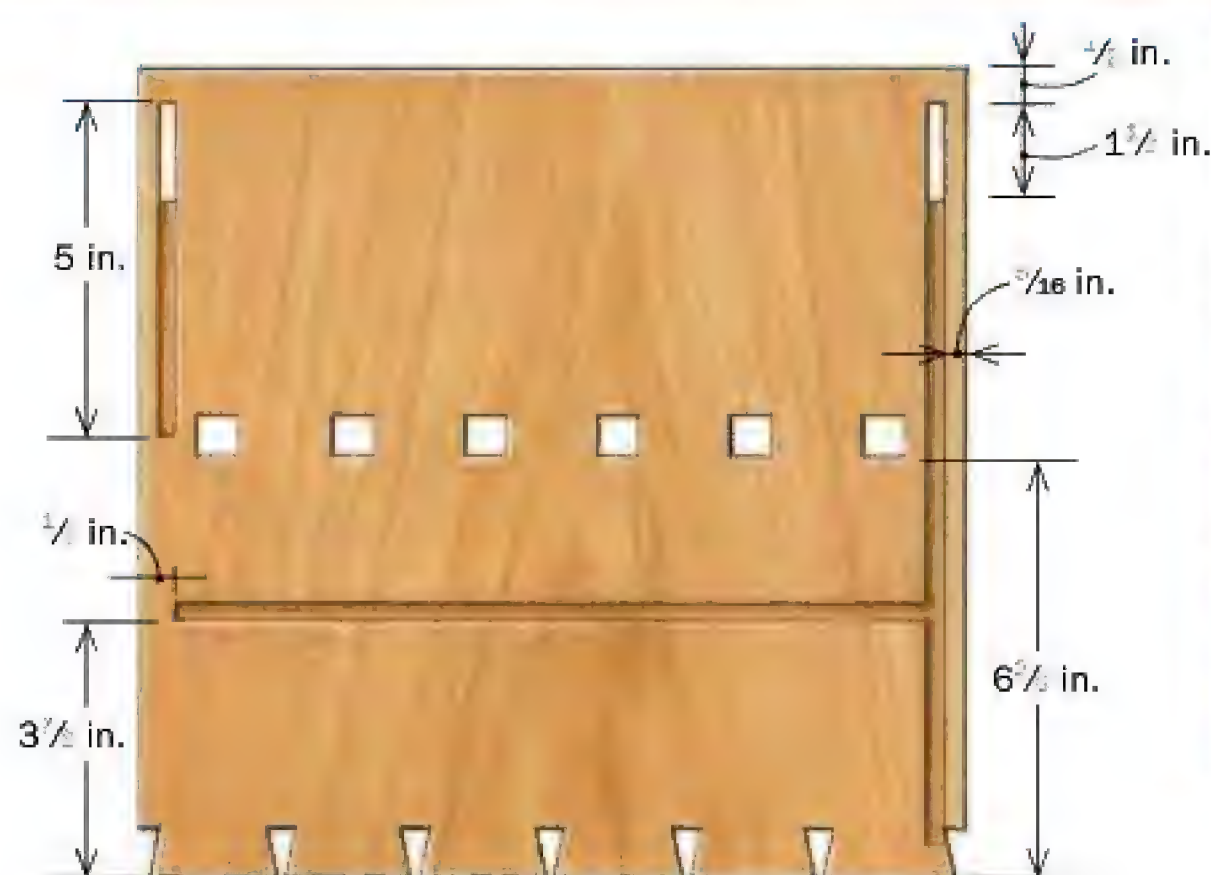


you are ready to tackle the pins. Scribe them directly from the tail board. Mark the waste areas with a pencil to make sure you cut on the right side of the line.

I try to cut right along the scribe line because it reduces the paring I have to do. I'm not trying to save time; instead, I'm trying to avoid errors, because I seem to create most of the gaps in my dovetails while paring. With all of the mating

surfaces, sometimes it's hard to figure out exactly where the joint is hanging up.

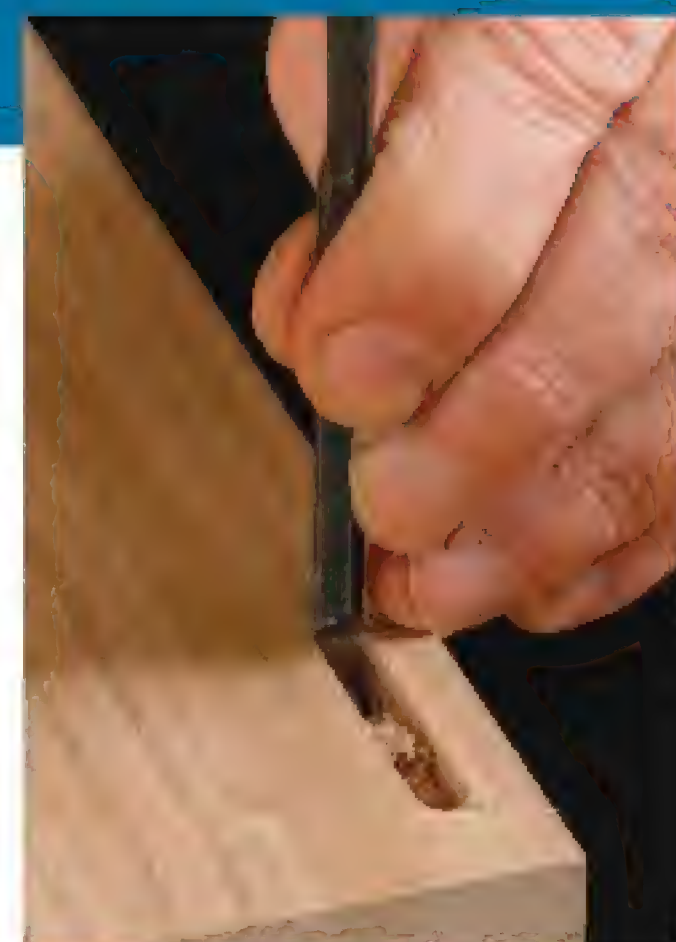
After coping and chopping out most of the waste between the pins, it's important to check how straight you made your cuts. It's common to veer away from the line as you cut. This results in wedge-shaped pins that are wider at the bottom. They can make fitting a pain and can lead to cracked parts if you try to force the joint



SIDE JOINERY DETAIL



Little through-tenons first. Start these on the outside face. Use a router with an edge guide and a $\frac{3}{16}$ -in. spiral straight bit to rout most of the way through (left). The groove will finish the job from the other side. Square up the mortises with a chisel (right).



Rout the grooves on the inside face. Set the bit slightly deeper than the tongues on the panels to allow for glue squeeze-out. Cut the grooves along the edges of the sides before resetting the fence to cut the narrow dado for the drawer divider. You'll need to groove the well bottom, too.

home. So the first task is to trim the pin walls straight. Now you can go about paring for a perfect fit.

Tips for tenons, too

The through-tenons on the well bottom are easy to handle with hand tools. When marking along the grain in butternut, it can be really hard to see the line. Instead of investing in a new pair of reading glasses, lay a strip of painter's tape across each face of the case sides before scribing the mortises. Once the mortises are marked out with a knife, peel away the squares for easy reading.

To cut the mortises, start by drilling out most of the waste at the drill press. Then



Easy tongue-and-tenon combo. Use a dado set to rabbet both faces of the panels to create a centered tenon. Then trim the tenons on the bandsaw as shown to leave a perfect through-tenon.

ASSEMBLY TIME



Surface and seal. The soft butternut planes easily and yields a shimmering luster (top). Apply a washcoat of shellac to all the parts, especially the end grain of the tenons and dovetails, but stay clear of the glue areas.

chop back to the scribe lines, working from each face. Undercut the inner surfaces a little as you chop. Cut the tenons just like the dovetail pins, sawing as close to the line as you dare. Then cope out the waste and pare to the line as necessary.

A hybrid joint

With the major case joinery complete, you can rout the grooves and through-tenons for the panels. Start by routing a short groove for the through-tenons on the outside faces of the sides. Once you groove the inside face, the two cuts will combine to create a through-mortise to accommodate the tenons at the top of the upper panels. This is an interesting joint I call a dog-eared tenon (actually I just made that up). The tenon is glued and pinned to the sides, while the rest of the panel is allowed to expand and contract with the seasons. Note that the grooves in the well bottom are shallower to avoid weakening it.



One big glue-up. Unfortunately the case glue-up can't be broken into smaller sub-assemblies. So do a dry run (above) to reduce some of the stress and avoid any surprises once the glue is on. For the actual glue-up, use plenty of clamps to bring the case together. Then put glue in the slots in the shelf tenons and drive wedges in place (left).

Get organized for the glue-up

Prior to assembly, use a backsaw to cut slots in the through-tenons. Then chamfer the ends of the tenons and dovetails, and plane or sand the parts. Butternut is too soft to scrape effectively so I'd avoid that. Apply a washcoat of shellac to the parts prior to glue-up, staying clear of glue surfaces. When dealing with protruding dove-

tails and tenons, it's important to seal the end grain before gluing or you'll end up with a blotchy finish there.

On a side note, one feature on this chest that you may want to skip is the half-mortise locks for the drawers and lid. I added them to keep the drawers closed during transit and to keep the tools secure once I'm at my destination. If you

FAST FRAME-AND-PANEL
ON THE TABLESAW

Bridle slot meets panel groove. If you run the workpieces in both directions to center the panel grooves, you can do the same thing on the tenoning jig to cut bridle joints that line up with the grooves. Align the blade with the inside edge of the groove (inset), then just flip the workpiece for a perfect cut on the other side, too.



Tenons last. Align the blade with the outside of the panel groove to cut the tenon cheeks (left). To cut the shoulders, trim away most of the waste first on the bandsaw to avoid a trapped offcut, and then use your miter gauge and rip fence (above) for the final cut.

do add them, be sure to cut the mortises for the lock bolts in the underside of the well bottom and drawer divider prior to gluing up the case. Trust me, it's much easier that way.

Once the case is clamped up, tap in the wedges. Finally, drill through the tenons at the top of the case and drive in pins for even more strength and sturdiness.

A power assist for the lid

I could have done the lid joinery by hand, too, but my table saw was sitting right there itching to tackle it for me, with a fast, accurate way to cut the bridle joints and panel grooves. I used a $\frac{1}{8}$ -in.-thick blade with a flat-top grind to cut this joinery. The bridle joint is exposed, so you want the slots to have dead-flat bottoms. Start by cutting the panel grooves, which are centered in the frame parts. Make one pass, and then flip the workpiece for a second pass, resulting in a $\frac{1}{4}$ -in.-wide groove that's perfectly centered. Now break out your tenoning jig. Start by cutting the slots in the stiles. Align the blade with one side of the groove and make a cut. Because you took care to center the groove, you can now flip the piece to cut the second side and it should be aligned with the opposite wall.

Cut the tenon cheeks in the same way, this time simply aligning the blade with the outside edge of the groove. To avoid trapping the offcut when cutting the shoulders, trim away most of the waste on the bandsaw, then cut the shoulder on the table saw. Cut a stub tenon on the center stile to fit the panel groove. Finally, use your dado



Clamp from three directions. A bridle joint needs a lot of help to pull it together. Start by clamping across the rails, then add clamps across the stiles (left). Check to make sure that the joints are pulling closed in each direction as you tighten the clamps. Finally, clamp vertically at each corner to ensure a good glue bond (above).

Dividers

ARRANGE THEM BY EYE



No-math solution for dividers. Start by milling divider stock to match the width of a $\frac{1}{4}$ -in. dado stack. Then set your tools where you want them and mark dado locations wherever you need a divider (1). Cut dados for the dividers in pairs (2). Install the dividers, making cutouts to allow easy access to your tools (3).

set to rabbet the panels, leaving a $\frac{1}{8}$ -in. gap between the panel and the frame.

The lid is attached with butt hinges, and a simple rope stay keeps it from opening too far. I used 4mm hemp cord threaded through wood blocks screwed to the lid and case side. Instead of knotting the rope, add glue and pound a wedge into the rope hole. Pare the rope and wedge flush with the block once the glue is dry.

The drawers are the standard dovetailed variety. I chose brown oak for the drawer front to add contrast and provide better purchase for the half-mortise lock screws.



Online Extra

For a video tour of the tool box and the author's essential set of hand tools, go to FineWoodworking.com/extras.

The $\frac{3}{8}$ -in.-thick pine drawer bottoms are glued along the front edge and screwed to the drawer back to help prevent sagging.

When mounting the cast-iron trunk handles, I replaced the supplied screws with through-bolts. I drilled a counterbore on the inside face of the sides so that the nuts would be recessed.

Divide and conquer

To keep tools from rattling around, I installed simple pine dividers in one of the drawers and the plane well. To secure the saws and scrapers, slot a pine block on the bandsaw. The kerf allows just the right wiggle room for sawblades and scrapers. The drawer with the dividers houses a set of chisels, a spokeshave, and layout gear.

The bottom drawer doesn't have fixed dividers. Instead, I've left room for removable boxes and trays. This lets me organize small items and keep them handy. I made a large tray for all my sharpening gear that I can take to my sharpening station. There's a small box for carving tools and another that contains hardware for the projects I'm



Simple storage for saws. Pekovich cut kerfs in pine blocks to secure his handsaws, scrapers, and combo square. The blocks are glued to an MDF base and installed as a single unit.

working on as well as the drill bits and screws necessary for installation. Finally, I have a small tray for odds and ends like tweezers, a pocket flashlight, and such.

I finished the chest by wiping on a few thin coats of shellac. This provides some protection, but doesn't leave the surface too glossy. □

Michael Pekovich is FWW's art director, and a prolific furniture maker.



Make Shellac Your Go-To Finish

My first experience with shellac, at age 14, was a disaster. I almost ruined a bookcase I'd built, and I swore off shellac altogether. But in time I learned how to use it correctly, and today shellac is one of my favorite finishes.

It's a cinch to apply, and because it dries so fast, you can apply multiple coats in a day and repair mistakes with ease.

It doesn't take an expert to get great results with shellac. Follow a few simple steps, and you can create a lustrous, satiny finish that

A simple
brushed finish
produces
stunning results

**BY MARIO
RODRIGUEZ**

makes grain and figure pop, no matter the species.

Fresh, dewaxed shellac is plenty durable

Shellac gets a bad rap for durability, in part because of confusion between waxy and dewaxed versions. Stick with dewaxed shellac; it dries to a hard, impermeable film that protects against heat and moisture and is compatible with all finishes. True, shellac won't hold up against spilled alcohol. But since dewaxed shellac bonds beautifully with every other finish, you can always follow it up with a wipe-on varnish to protect vulnerable surfaces.

Shellac's freshness affects its performance and durability. That's where I went wrong with my bookshelf: I used old shellac and



Choosing the right version

Shellac is widely used as a sealer coat under other finishes, but it can produce a striking, low-luster finish on its own. For maximum durability, use dewaxed shellac, whether pre-mixed or flakes. Shellac is most durable when it's fresh, so try to buy only what you'll use in the next few months.

Flakes offer safe, subtle tones

Dewaxed flakes range in color from clear to amber (orange) to deep reddish browns, like garnet. Unlike dyes and stains, shellac flakes offer a foolproof way to impart warm, subtle tones without any blotching. Color differences are more apparent on lighter woods like maple and cherry than they are on darker woods like walnut (below). Dewaxed flakes are available from online retailers.



Pre-mixed is convenient

If you want a clear finish that adds just a hint of warmth, Zinsser's SealCoat (below, right), is the right choice. It's the only dewaxed shellac that's available premixed at home centers and hardware stores. Keep in mind when buying any shellac that if the packaging doesn't specify "dewaxed" or "wax-free," it probably isn't.



Skip the wax. Wax is an ingredient in some shellacs, including Zinsser's "clear" (above) and "amber" products. When waxy shellac dries, the wax allows moisture to permeate the finish, making it less durable.

Use dewaxed instead. Without the wax, shellac dries to a hard film that's impervious to moisture. For premixed, you have one choice: Zinsser's SealCoat.

How to mix your own



Grind for speed. Ground flakes dissolve completely in a few hours. If you don't grind them, it's best to give them a full day.



Mix with denatured alcohol. Give the mixture an occasional shake to keep the shellac from congealing at the bottom of the jar.



Strain solution before brushing. When the flakes are fully dissolved, pour the solution through a medium-mesh paint strainer to remove any impurities.

Denatured alcohol	1-lb. cut	1½-lb. cut	2-lb. cut
1 cup (8 fluid oz.)	1 oz. flakes (by volume)	1½ oz. flakes (by volume)	2 oz. flakes (by volume)

Easy finish, step by step

PREPARATION

Beautiful finishes start with careful prep. All surfaces should be sanded thoroughly, to remove machine and mill marks.

Prep surfaces with sandpaper. To ensure uniformity, sand all surfaces, starting at P120 grit and finishing with P220.



Flush between grits. Before moving to a finer grit, flush surfaces with alcohol and wipe them down with a rag to remove any loose abrasive particles, which can leave scratches.

Wipe-on alternative

Where brushing would cause excessive drips, like on a chair splat (right), shellac can be applied with a pad.



Charge the pad. Fold up a piece of wool (or other absorbent cloth) and place it at the center of a lint-free cotton rag. Use a squeeze bottle to fill the wool until it's soaked but not dripping.

THE FIRST COAT ACTS AS A SEALER

Brush on a coat of 1-lb. cut shellac to raise the grain and seal the surface, creating a level foundation for subsequent coats.



Tack strips elevate the workpiece. Rodriguez uses scraps of plywood with protruding drywall screws to hold the workpiece, allowing him to flip it as needed without marring the finish.



Coat brush in alcohol first. Whether you're softening an old brush or using a new one, work alcohol into the bristles to help the brush flow smoothly and keep shellac from drying in the reservoir (the hollow area where the bristles meet the metal ferrule).



Slow, but safe. Wrap the pad so its surface is wrinkle-free. The wool releases a thin coat of shellac through the cotton onto the surface, so it takes more coats to achieve the same look as parts that have been brushed. Seal the pad in a glass jar to keep it supple between coats.



Hit the edges first. When brushing narrow edges with a big brush, drips are likely to form on adjacent surfaces. If you brush the edges first, drips will form on the large, flat, dry surfaces, where they can be cleaned up quickly and easily.

it never fully dried. To be sure it's fresh, buy and mix shellac only as needed. Store it in a cool, dry place, like a basement or refrigerator. If its freshness is in doubt, brush some onto a scrap. If it's still tacky in two hours, it's not fresh.

Thin shellac to suit the project

Whether you're using flakes or pre-mixed shellac, adjust the thickness to suit the job. The "cut" refers to the ratio of flakes to alcohol: Add 1 oz. of flakes to a cup (8 oz.) of alcohol to make a 1-lb. cut, 2 oz. of flakes to a cup for a 2-lb. cut, and so on. If you don't have a scale, you can measure flakes by volume with standard kitchen measuring cups. One oz. by weight is roughly equal to 1 oz. by volume, or $\frac{1}{8}$ cup.

For a small project like this end table, mix about a pint of shellac, half at a 1-lb. cut and half at a $1\frac{1}{2}$ -lb. cut. Start with a 1-lb. cut as a sealer, to raise the grain and ensure that successive coats build uniformly. Follow with two coats at a $1\frac{1}{2}$ -lb. cut to build the finish. I use a 1-lb. cut for the final coat because, with more

alcohol, it flows and levels better, which minimizes brush marks.

Zinsser's SealCoat comes in a 2-lb. cut; for a 1-lb. cut, combine one part SealCoat to one part alcohol. For a $1\frac{1}{2}$ -lb. cut, mix two parts SealCoat with one part alcohol.

Prep surfaces and seal

Sand all surfaces, working from P120 grit to P150, then P220. Between grits, flush the surface with alcohol to remove lingering abrasive particles and reveal any surface flaws that might need fixing.

I apply shellac with a brush because it builds the finish in fewer coats than a rag. I use a 2-in. Chinex brush, but natural China bristle or Taklon work well, too.

To help avoid drips and detect brush marks and other imperfections, lay parts flat if possible.

To start, apply one coat of 1-lb. cut shellac as a sealer. Hit the edges first. Then, for flat surfaces, load the brush and tap the tips of the bristles on the inside of the container so that it's full, but not dripping. To avoid reaching over



Brush on a sealer coat. A thin 1-lb. cut raises the grain and dries quickly. In two hours, it can be sanded with P320-grit paper.



Don't look back. Apply shellac in long, continuous strokes with little overlap. If you miss a spot, don't go back. "Backbrushing" into drying finish will leave deep brush marks. Subsequent coats will cover small missed spots without any problem.

Step by step continued

BUILD THE FINISH

Sand the first coat smooth, then apply two coats of shellac at a 1½-lb. cut to build a uniform protective film.

Sand between coats. When the surface is completely dry, sand with P320 grit. Use a stearated paper, like Norton's 3X, which has a soapy coating that resists clumping and clogging.



Dry finish won't clog sandpaper. Sanding dry shellac will produce a fine powder (right). If the finish isn't quite dry, the sandpaper will clog almost immediately.



A heavier cut builds faster. For the second and third coats, brush with a 1½-lb. cut. Heavier cuts get tacky soon after they're applied, so work quickly.

TIP

Brush care is easy



To store your brush, give it a few dips in alcohol and wrap it in a paper sleeve to keep the bristles straight and clean. The shellac that remains in the bristles will harden, further protecting the brush's shape during storage. When you're ready to use it again, just soak it in alcohol to soften it up.

drying finish, start at a far corner and work toward your body. Use long, continuous strokes, overlapping them by ¼ in.

If you miss a spot or leave a drip, don't go back and touch it up—overworking it will leave deep brush marks that have to be sanded out. In two hours, sand with P320-grit to knock down the raised grain. Don't use alcohol to remove dust after sanding shellac, because it will reactivate the finish. Use a tack cloth or compressed air instead.

Heavier coats build faster

The second and third coats—at a 1½-lb. cut—can be applied generously, in the same fashion as the first. Heavier cuts get tacky almost as soon as they're applied, so work quickly to avoid brush marks.

You can apply your third coat two hours after the second coat,

then let everything dry overnight. The finish will appear very glossy, but don't sweat—you're not done.

Finish the finish

Before the final coat, it's time to address any drips or imperfections. Use a fresh razor like a card scraper to knock down drips, then rub out all surfaces with a maroon abrasive pad for an even matte sheen. Use the 1-lb. cut for the final coat, and let everything dry overnight.

For the final rubout, use super fine (0000) steel wool to knock down the sheen. If you want to add a coat of oil-based varnish for extra durability, now's the time. Apply paste wax with a soft cotton T-shirt rag, then buff it off for a deep, satiny finish. □

Mario Rodriguez is an instructor at the Philadelphia Furniture Workshop.

A FINAL THIN COAT

Repair drips and brush marks, then brush on a coat of 1-lb. cut.

Eliminate drips. Use a fresh razor like a miniature card scraper to level drips and other imperfections. Don't bear down; instead, take multiple light passes until the drip is flush with the rest of the surface.



Follow up with a rubdown. After making repairs, rub everything down thoroughly with a maroon abrasive pad (equivalent to 000 "extrafine" steel wool).



Finish with a 1-lb. cut. For the final coat, go back to the thinner, 1-lb. cut. It has longer open time, so it flows and "self-levels" a little better, minimizing brush marks.

FINISH THE FINISH

Use steel wool to get a level, matte surface. Then, apply paste wax to create a lustrous, satiny finish that's soft to the touch.

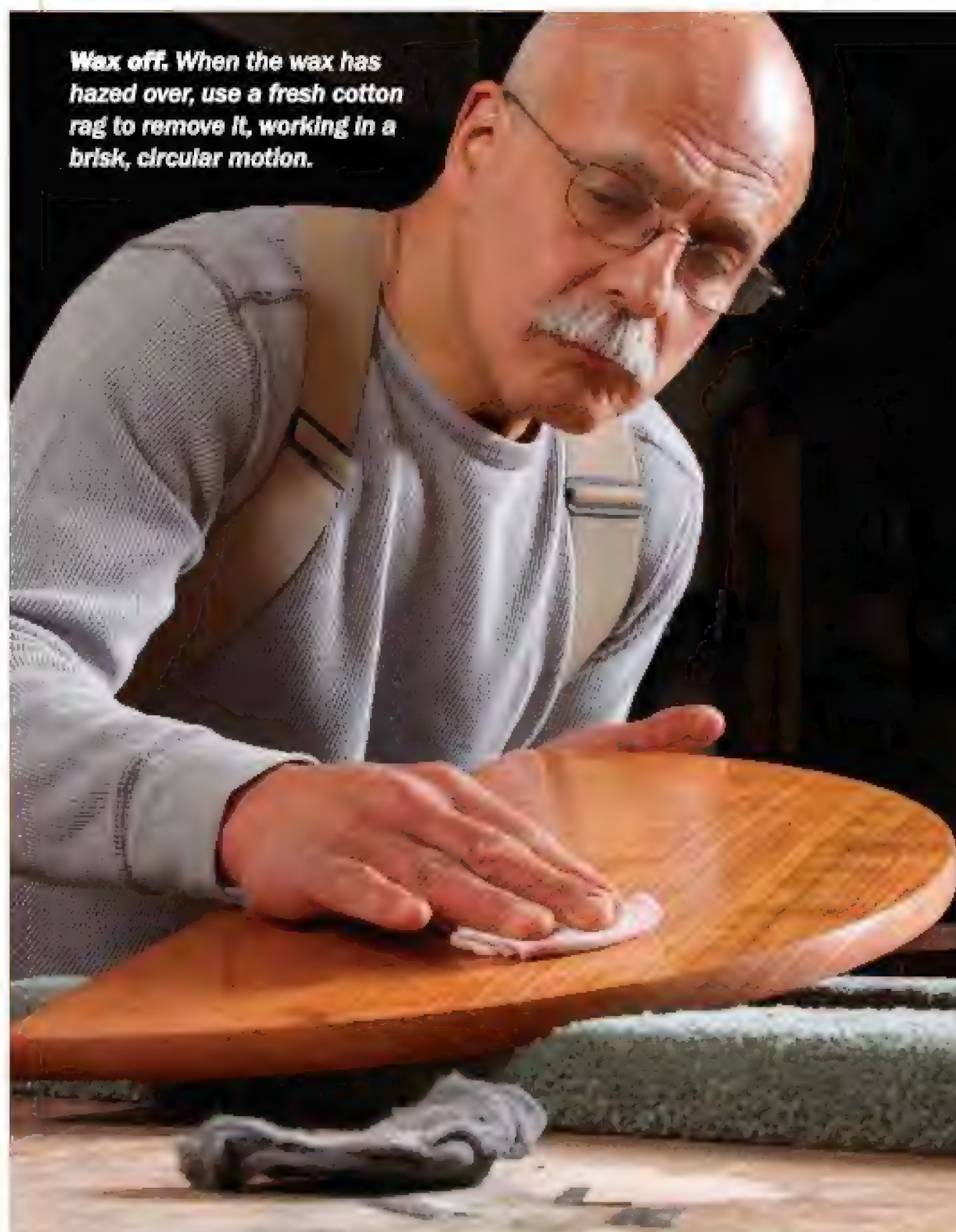


Knock off the gloss. For the final rubout, use 0000 "super fine" steel wool to transform shellac's naturally glossy sheen into a uniform matte surface.



Wax on. Paste wax is the key to this satiny finish; use a soft T-shirt rag to distribute a very thin layer of wax across the surface.

Wax off. When the wax has hazed over, use a fresh cotton rag to remove it, working in a brisk, circular motion.



Great Glue-Ups, Guaranteed

The secret is cauls, and lots of them

BY MICHAEL FORTUNE



The essential glue-up kit

Fortune keeps commonly used hardwood cauls in buckets, ready to go. For more on his favorite cauls and clamps, see *Fundamentals: "Gearing up for glue-ups,"* p. 22.

When assembling furniture parts, there is one rule I always remember: Glue is a slippery film. Once it is applied and clamps are tightened, everything wants to slide. Restraining those parts—holding them in perfect position—is just one reason that I use clamping cauls. Cauls are simply extra pieces of wood, usually wrapped with tape or coated with wax to resist glue, held in place with additional clamps.

In this slippery situation, the direction of the clamping force is critical. So I choose and position clamps so that their force will pass through the center of the joint, and at right angles to it.

As a pro woodworker, I can't afford to invest hours of time making perfect parts only to end up with gappy joints, crooked assemblies, or bumpy tabletops that require a lot of planing or sanding. And with the right clamps and cauls, I don't have to.

For a full rundown of the glue, clamps, and cauls I've come to rely on over the years, turn to *Fundamentals* on p. 22. In general, I use Titebond III,

because of its longer working time, and low-tech F-style clamps and pipe clamps. Their small jaws let me know exactly where I am applying force. As for cauls, I generally make them from hardwood and apply clear packing tape to one edge to resist glue.

The dry run: Follow this checklist

With the exception of panel glue-ups, a dry run is essential to make sure that you have everything you need for the glue-up, that the joints will close perfectly, and that the assembly will be square. Here's what to do now so you won't have surprises later.

First, make sure the parts are clearly marked for their positions in the assembly. Marking on a glue face doesn't work well because the glue will obscure the marks. That's why I usually employ the triangle method on a visible face, using light pencil marks. Having mistakenly assembled parts upside down before, I am very methodical

Panels

Divide and conquer

By using cauls and gluing only a few boards at a time, Fortune produces perfectly aligned panels with no planing necessary.

1

Smart setup. Whether on a table or sawhorses, run stiff cauls across the bottom with your boards on top. You need to spread glue along one edge of each board only, and then rub them together a bit as you assemble them. Do not try to glue up more than three or four boards at once.



2

Tighten cauls first. With the boards pressed lightly together, you can clamp the cauls fully. Place a pair every 9 or 10 in. Fortune used longer cauls here, anticipating a second stage (below).

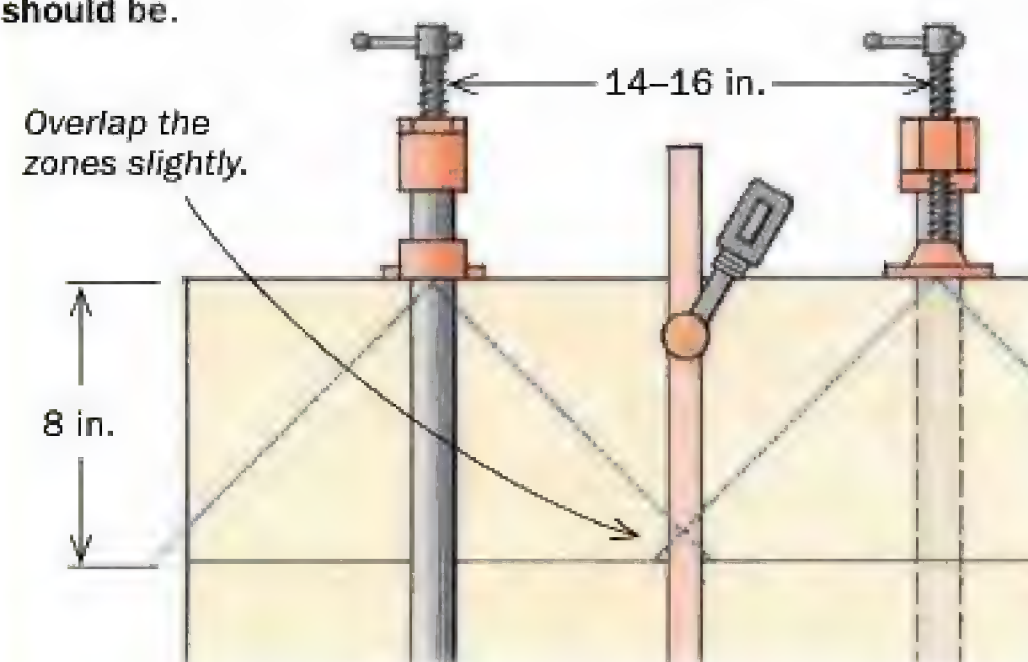


3

Close the joints. Alternate pipe clamps top and bottom, with small waxed pads under the pipes to keep them from staining the wood and to keep the jaws centered on the edges.

MIND YOUR PRESSURE ZONES

Clamping force radiates outward at 45° angles, so the width of the outside boards determines how far apart the clamps should be.



Stage two for wider panels

For panels wider than three boards, Fortune works in stages, making two subassemblies and then joining them as shown.

Cambered cauls on top. With two smaller assemblies done, Fortune completes this wide tabletop. He rejoins the mating edges and uses cambered cauls on the top to get good pressure on the one glue joint in the center and keep the parts aligned there.



4

Level the ends, too. Fortune uses short, flat cauls to align the very ends of the boards.



about marking! Mark on a piece of masking tape if you are squeamish about writing on your project or you are assembling a part that has been prefinished.

The next step is to choose clamps that will direct the force properly, and cauls that will keep the parts in perfect position when you tighten those clamps. But before putting on every last clamp and caul, I lightly clamp the assembly together so the joints close and I can apply a glue-resist. If you read my recent article in *FWW* #232 ("Never Struggle with Squeeze-Out Again"), you know I apply wax along every joint during the dry-fit, which makes squeeze-out a snap to remove later. Any silicone-free furniture wax will work. You just rub on a small amount using a piece of scrunched-up tissue. Later, when the glue is dry, squeeze-out simply flicks away, usually in one piece. And the wax residue washes away easily with alcohol.

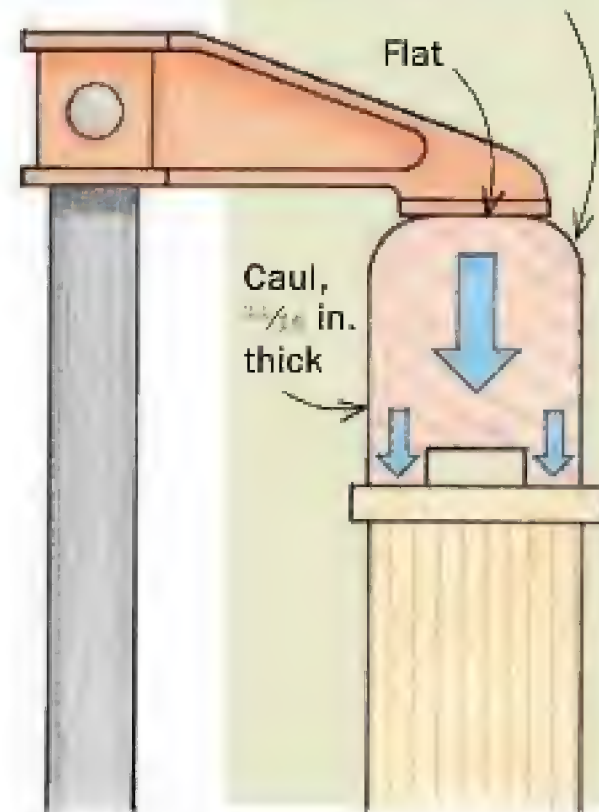
The next step is to put on all the clamps and cauls, tighten everything, and then check diagonals to be sure the assembly is square. Some people put a square in the corners to check glue-ups, but that will give you an incorrect reading if the parts are even slightly bowed.

If things aren't square, trim the joints if needed or reposition the clamps to make it so. But the main reason to check for square now is to be sure you can reach through all the clamps and battens to check again later, when the glue is on.

One other note: Left exposed overnight, tropical woods will develop an oxidized surface that acts as a glue-resist where you don't want one. So with woods like bubinga and wenge, I always lightly scuff-sand the surface of the joints immediately before applying the glue. By the way, this oxidation also happens with domestic woods if left for a week or two, so do the same to those joints.

Easier panel glue-ups

I was taught that panel glue-ups will always come out somewhat misaligned, and that planing, scraping, and sanding are inevitable. That is simply not true. With the right cauls and a bit more preparation, you can assemble dead-flat tabletops that will require



1/4-in. roundovers

Flat

Caul,
3/8 in.
thick

Edging

Narrow edging that disappears

Fortune prefers to edge plywood with thin strips, which are less obvious than thick ones. His specialized cauls apply even pressure for undetectable glue joints.

Cauls are easy to make. Round the edges of a board on the router table, then rip caul pieces off both edges at the tablesaw before grooving them as shown, with either a dado set or a single blade and multiple passes.



Keep the panel vertical. This makes for fewer drips. Apply glue to the edge but not the edging, which will start to cup immediately. Where F-style bar clamps won't reach, cam-action edge clamps work wonderfully.

CLEVER CAULS

These cauls are grooved on the inner face to apply pressure at the edges, where it matters most, and partly rounded on the outside face to be sure that clamping force is centered on the caul.



**GRIP 32106
SMALL EDGE CLAMP**
\$20
ToolKing.com

Mitered edging frames a panel

Wide edging is best for tabletops, where it frames a plywood panel nicely. Fortune uses biscuits to align the edging and strengthen the joints. The trick is getting good pressure on the miters.

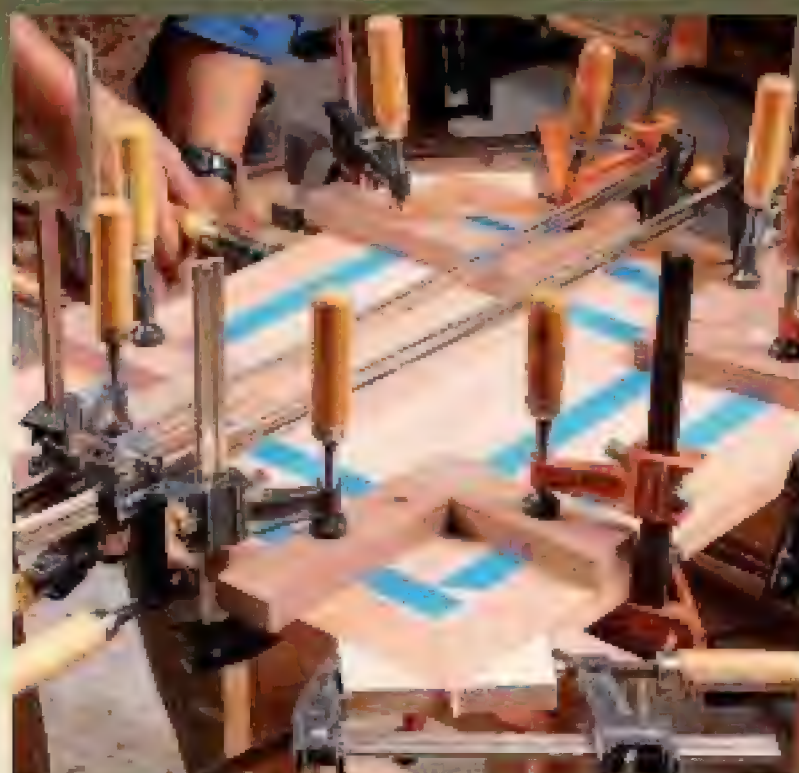
Glue blocks are the secret. Fortune makes these angled clamp blocks from pine, a bit thinner than the edging. Attaching them is easy: Apply glue and simply rub them into position. Wait an hour, and the joint can be clamped.



Clamp the corners first. Clamp across the glue blocks, aligning the clamps with the center of the miter. The biscuits will keep the parts level enough for now.



Cauls on top. The edging is a bit wider than the plywood panel, so the blue tape accounts for the offset. Short cauls on the top side are enough to ensure that the edging stays flat.



Clamp the middle. These clamps ensure that the center sections of the edging are tight to the panel too.



One last caul. As a last bit of insurance, Fortune clamps short, flat cauls across the corners (above). The glue blocks are easy to remove afterward (right). Just bandsaw them close, and plane away what is left.



Joinery

Mortise-and-tenon frames

Even with full-length tenons, clamping pressure can pull parts out of alignment. Again, cauls offer peace of mind.

Selective gluing. Fortune puts most of the glue in the mortise, and just a bit on the tenon shoulders, but none on the tenon itself, where it would be squeezed off and end up as squeeze-out.



Caul first, clamp second. Put a stiff caul across the frame, and tighten it firmly (left). Then fully tighten the clamp (above). Fortune prefers F-style clamps for many glue-ups, as they can be positioned right on the centerline of the joint, helping to keep the parts level.

only moderate sanding to get ready for a final finish. And you won't need biscuits or splines to align the boards. Those are dangerous anyway, often making a surprise appearance when you crosscut the end of the panel.

Provided that you have machine-planed your boards to uniform thickness, the first trick for a good glue-up is smart edge-jointing. Mark the boards carefully, and then put the top face against the jointer fence for one board, and the bottom face against the fence for the next. This way, the joint will always be tight and flat even if the fence isn't square to the table.

Next, for perfectly flush joints between the boards, you need a minimum of three pairs of extra-stiff cauls, and enough to have a pair every 9 in. or 10 in. along the glue-up, starting near the ends. I tighten the cauls first, which keeps the middle of the panel flush and flat as I bring the boards together.

But that's not the whole story. The cauls won't work for edge-gluing more than three or four boards at once. So the other key is to do wide glue-ups in stages.

I use pipe clamps for panel glue-ups, alternating them on either side to maintain even pressure along the centerline, and I put thin waxed pads under the bars. These lift the clamp jaws so they align with the

centerline of the panel and keep the bars off the glue lines, where the iron can react and stain the wood very deeply.

As I mentioned, I don't bother with a dry run, and because the glue scrapes off easily, I don't bother with the glue-resist either. Most PVA glues will set within two hours, so the clamps can be removed and the squeeze-out scraped off with a common paint scraper (I regrind the edge from time to time). If left longer than that, the squeeze-out will begin to bond to the surface, and chipout can occur along the glue line. Avoid the urge to machine-plane the assemblies, since the grain is rarely all going in the same direction.

Tight dovetails

Like most woodworkers, Fortune leaves his pins and tails a little proud, and planes them flush later. He uses notched cauls to get good pressure on the tail boards.



Custom cauls in a jiffy. Start with a block of wood large enough to make four cauls. Hold it against a tail board (left) to mark the notches. After notching the block on the tablesaw, slice off the cauls on the bandsaw (right), slightly thinner than your workpieces.



Glue the tails only. Any glue on the pins will squeeze out into the inside corners of the box, where it is harder to remove.



Precise pressure. Notched cauls reach around the slightly protruding pins to put firm pressure on the tails, for tight joints all around.

If you are adding another board or group of boards, be sure to scrape away the glue first so the cauls can do their job, and re-joint the mating edges. Here I use cambered cauls on the top side, so I'm sure to get good pressure on that center glueline.

You'll be surprised at how flat your panels come out. At the most I do some work with a card scraper to level the joints, but usually I go from glue-up right to the random-orbit sander.

Invisible edging on plywood

I tend to use thinner edging on shelves and doors where I want an unobtrusive look, and wide mitered edging on tabletops.



Wipe and check. This is one time when you want to wipe away a bit of the wet squeeze-out, so you can see the joints clearly and make sure they are fully closed.

Casework

Square plywood cases



Fortune tends to put these together with biscuits and butt joints, making for a wobbly glue-up. But he has solutions for that, too.

Always mark parts. In any glue-up, you need to know the position of every part in the assembly at a glance. Fortune uses the carpenter's triangle method, marking lightly on a visible face.



Room for square. During the dry-fit, make sure you'll have room later to fit in a tape measure and check diagonals.

But in both cases, the joint between the hardwood and plywood should be almost invisible. Also, I make the edging a few hairs thicker than the plywood when I put it on. You want to be leveling the edging afterward, not planing or sanding the extremely thin veneers on today's hardwood plywood. Also, the edge of the plywood tends to swell a bit when the glue hits it, making the extra thickness even more important. To be sure the edging is slightly proud on both sides, I just feel with my fingers.

Special caul for thin edging—The challenge with thin edging is that it doesn't spread the clamping pressure. Also, once the edging hits the glue it immediately begins to cup outward, opening the joint on the top and bottom. To counter both issues, I've developed a great caul. I make these

from a square hardwood blank a bit shy of $\frac{3}{4}$ in. in both directions. The inside face has a wide groove to focus clamping pressure at the edges, and the outside edges are rounded slightly so the clamp pressure is always centered (see drawing, p. 46).

Mitered edging needs more help—Wide edging is usually mitered at the corners, which need to be fitted carefully before glue is applied. Also, I use biscuits to align the edging with the panel and strengthen the miters. In fact, I use biscuits often in my work (see "Fine Furniture with Biscuit Joints" in *FWW* #227). It is best to spread glue in the slots but not on the biscuits, as they will swell and be hard to insert.

In this case, I use two types of cauls to guarantee success. I put short, flat cauls along the top edge to keep the edging flat as I clamp it. To allow for the edging's

extra thickness, I space the cauls off the plywood with blue tape.

To clamp the miters tightly, I use another of my favorite cauls: simple angled blocks, glued to the frame. These are a lifesaver on angles and curves of all kinds, and they attach quickly using a simple rub joint with white glue or Titebond I (both set up faster than Titebond III). Cyano-acrylate glue also works (with the activator). You might be tempted to attach the blocks with hot-melt glue or double-sided tape, but those always creep when pressure is applied.

Don't use the cutoffs from your edging as clamping blocks; the grain is short, making the blocks hard to remove once glued on. Instead, cut softwood pieces to the same shape but with the grain running along the long edge. Make them narrower than the edging to allow the flat cauls to go on.



Keep squeeze-out in check. For full strength but minimal squeeze-out, brush glue into the biscuit slots only, nowhere else.

TIP

Fortune uses small angle-blocks to hold panels upright, acting as third and fourth hands.



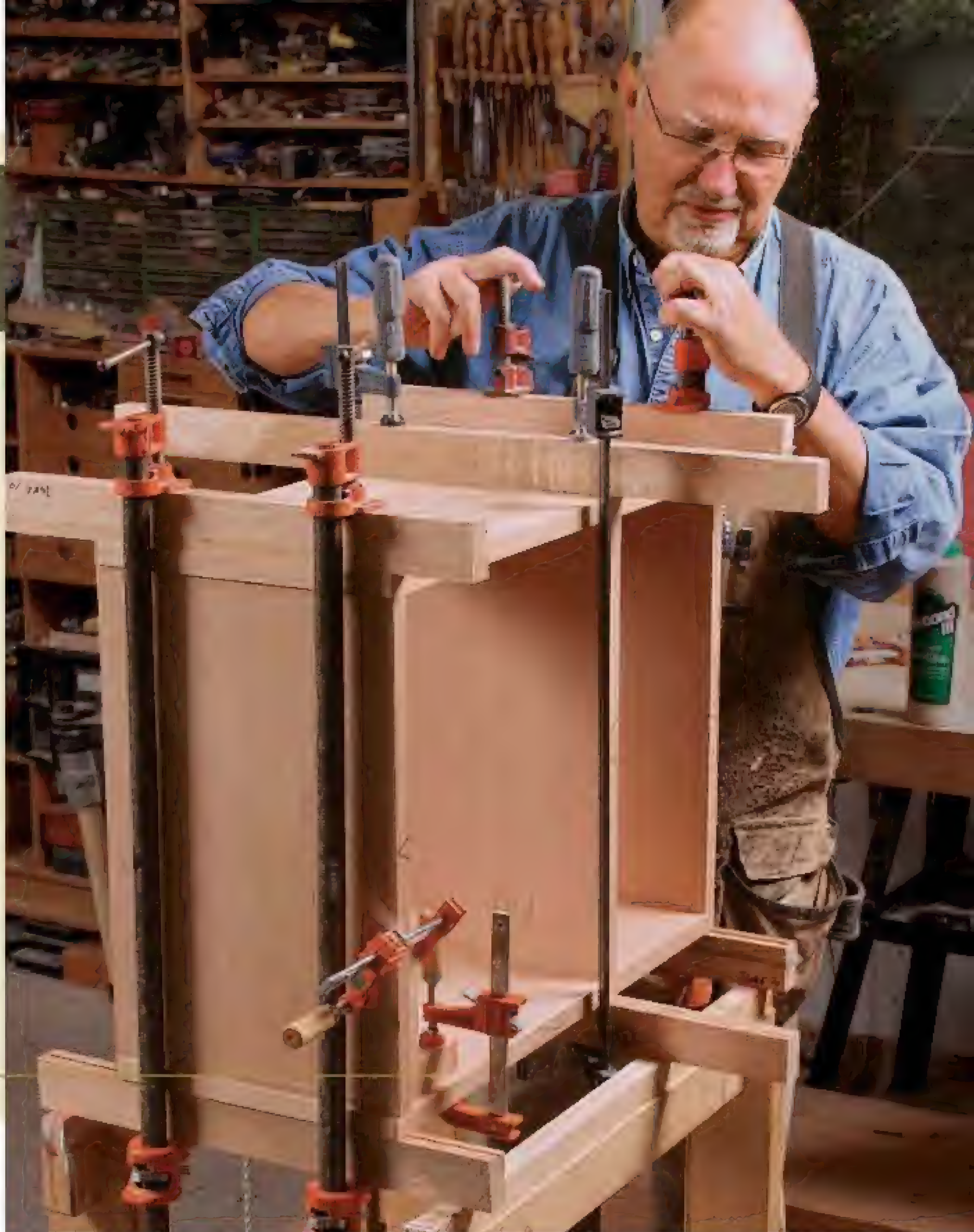
Cauls for tenoned frames, too

What many woodworkers don't know is that even with deep mortise-and-tenon joints, such as those on doors and table bases, parts can tilt out of alignment when clamped. So I clamp a long, stiff caul across these assemblies, too.

Through-mortises are trickier. Usually the tenon protrudes somewhat, at least at glue-up, so you have to place clamps above and below the tenon, without applying uneven pressure and opening a gap along the tenon shoulders. This also gives you access to the tenon, so you can drive in wedges (if you are using them).

Notched cauls for dovetails

Like many woodworkers, I leave my pins and tails proud about $\frac{1}{4}$ in. and use notched cauls to work around the protrusions and



The right cauls. Straight cauls work fine at the ends of the case, where clamps can reach, but the middle shelves get cambered cauls to be sure even pressure is applied across the entire joint.

get direct force where needed, I usually use poplar or basswood. Pine is too soft and will crush if the pins are close together. Also, I wax the cauls, because tape doesn't work on the uneven surface.

In theory the joint is self-aligning, but sometimes I apply a straight caul along the pins board, just below the tails, to be sure to pull the joint tight in this direction, too. But only light pressure is necessary. Too much will distort the box.

Finishing touches

Just before the project is finish-sanded, it is a good idea to wipe it down with de-

natured alcohol. Any glue left around the joints or errant gluey fingerprints will show up as shiny or white spots, depending on the glue.

The best way to remove any glue you find is with a card scraper followed by a light sanding. Just sanding it off may push it into the wood fibers. This step is particularly important if you plan to stain your project. □

Michael Fortune is a contributing editor. He makes custom furniture in Lakefield, Ont., Canada, and teaches woodworking throughout North America and beyond.

Smooth Curves with Hand Tools

Create silky,
sinuous edges
faster than routing
or sanding

BY JEFF MILLER

Curves of every style

Every furniture style has its own visual language, and the vocabulary usually includes curves. Prime examples are, from left, the formal legs on a traditional Shaker stand, the scrolled base on Alan Turner's period dresser, and the restrained arcs on Chris Gochnour's contemporary desk or the author's modern chair.



LEGS



BASES



DRAWERS

When I started building furniture, my designs were simple, squarish Shaker and Mission-style pieces. But as my skills grew, I began drawing curves inspired by the human body, nature, or architecture. Curves became crucial to my work, making it more expressive, more appealing to eye and hand.

Whether you bandsaw curves or template-rout them, they'll need smoothing afterward. Many woodworkers struggle with this and resort to sanding—dusty, tedious work that doesn't yield fair curves or crisp surfaces. I'll show you a better way to smooth both convex and concave curves using a handful of basic tools: handplane, spokeshave, rasp, and scraper. You'll get smooth curves without kinks, flat spots, or bumps—surfaces that invite hands to run along the edges of your work.

Bear in mind that these tools are for flat (so to speak) edges, as opposed to sculpting freeform, rounded shapes. Alf Sharp covered those in *FWW* #208.

Handplanes can handle some curves

For gentle-to-moderate convex curves (or very gentle concave ones), I start with a sharp handplane set up for a light cut. A plane chatters less and smooths more efficiently than lighter tools.

With a bench plane, I use a standard grip on the handle and tote. I also hold a block



Essential kit for curves

You can smooth curves quickly with just a bench or block plane, a spokeshave, a rasp, and a scraper. Miller keeps them all handy, and starts with the largest tool that can handle the curve. Mass equals momentum.

BLOCK OR BENCH PLANE

The popular No. 4 smoother (top) works well; a smaller bench plane perhaps a little better (Miller often uses a No. 2).

Most versatile is a high-quality block plane (bottom). Miller says it doesn't need an adjustable throat opening or a low angle. Just sharpen the blade and set it for a light cut.

SPOKESHAVE

The shave's short sole lets it smooth hollows that a longer tool would bridge over. A flat-soled shave works well on steep convex curves and moderate concave ones. A convex sole reaches into tighter concave curves, but is harder to control.



RASPS

The rasp fits where edge tools won't. Miller uses a fine-grain Auriou (their No. 13) but has a coarser rasp (a 9 or 10) for heavier stock removal. There are even coarser models, but they are for 3-D shaping and rounding.



SCRAPER/SANDING BLOCK

Use a card scraper or sanding block on tearout-prone areas where grain changes direction, or for smoothing spots that have already been worked by the other tools. Set up the scraper with a light to moderate burr.



Compass plane is a curve specialist

If you do curved work often, consider getting a compass plane (see "Why You Need a Compass Plane" by Paul Schürch, *FWW* #227). Its flexible sole adjusts to a range of curves. A few companies make new models, but an old Stanley 113 is fairly easy to find and is still the best.



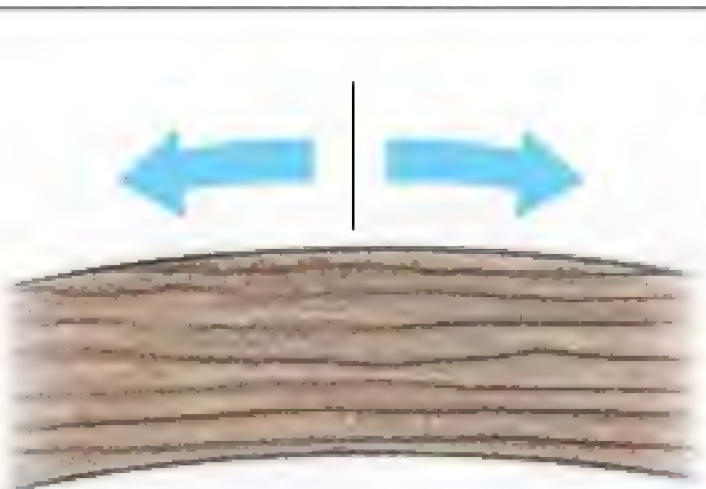
CHAIRS

Convex curves



PLANES FOR LARGE CURVES

Miller likes to start with the largest plane that can navigate the curve. A heavier tool will chatter less and leave a smoother surface, but its longer sole requires more finesse to control.



To minimize tearout with edge tools, work in the direction of the emerging grain. Read the grain on the side of the piece to orient the work. Most often, you will find yourself planing "downhill" from the crest of a convex curve.



PLANE WITH THE GRAIN

Hold a block plane with a forefinger on the front knob and the opposite hand wrapped around the front to apply downward pressure as you move forward.

plane with two hands. On convex curves, very little of the sole rides the surface, so control the tool by balancing downward pressure, fore and aft, to keep the edge in the cut. Two things help: First, power the stroke with your lower body, not your arms. Second, roll the plane forward as you move, as if you're pushing it around a large wheel. On concave curves, skew the tool to shorten its sole. With any curve, if you can't follow the curve with a plane, it's time to switch tools.

Shaves work curves, inside and out

Spokeshaves are made to smooth curves, both convex and concave. The short sole makes it easier to follow a curve, especially when the radius is tight or changing.

Hold the tool with your thumbs pushing on or near the blade and your fingertips at the front. This lets you vary the angle of attack to follow the curve as you push with your lower body. The shave has very little mass to dampen vibration, so work slowly to avoid chatter. A sharp blade is crucial.

Skewing the tool lengthens the sole on the surface, reducing chatter, bridging high spots, and making it easier to start a cut. Be careful not to bevel the surface sideways, though. Check it periodically with a square.

To avoid tearout where the grain changes direction at the bottom of a concave curve, try rolling the tool back so that the edge stops cutting as you approach the bottom. Finish those transition areas with a scraper or sanding block to remove any tearout.

SPOKESHAVE FOR TIGHTER CURVES



A spokeshave handles steep curves more nimbly than a handplane. Control the shave with your thumbs on the back edge of the blade or the shave's body. Your index fingers regulate downward force on the front of the tool.

TIP

WATCH THE LINE



To avoid beveling the edge, use the bandsaw marks to track your progress. Try to remove them evenly as you go. Once they're gone, switch to a square as a final check.

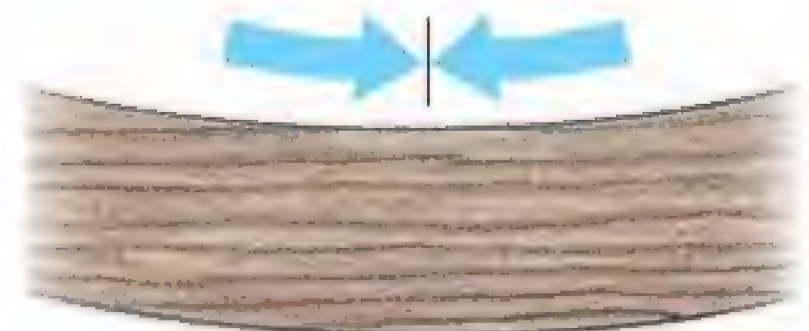
Concave curves

START WITH A SPOKESHAVE

With its minimal sole, a spokeshave can settle into concave curves that are too deep for a handplane to fathom.

WORK DOWNHILL

On a concave edge, the grain will typically change direction at the bottom of the valley.



Keep a rasp ready

On some curves, the radius is too tight, the curve dies into a corner, or the surface just can't be reached with an edge tool. A rasp's half-round face is ideal for tight inside curves and its cutting action lets you approach the work from any angle. Hold it by the wooden handle (a must) with the other hand guiding lightly at the tip. A well-sawn curve needs only a light touch with a fine rasp, but the surface will be rougher than one left by a plane or spokeshave. Follow with a scraper or sanding block. □

Jeff Miller builds furniture and teaches woodworking in Chicago.

SCRAPE OR SAND THE TRANSITIONS



After working the surface with edge tools and a sanding block, use a card scraper to remove any tool marks and refine the surface, especially in tearout-prone transition areas.



Most curved edges can be smoothed with a sanding block shaped to fit the workpiece. It's great for tight curves or where grain direction changes. Start with P150 grit.

VERY TIGHT CURVES? USE A RASP



Two hands. Angle the rasp slightly, push forward (rasps do not cut on the pull stroke), and lift at the end of the stroke.



Remove the rasp marks. The surface left by a relatively fine-grain, higher quality rasp is easily cleaned up with a scraper.



Sand for consistency. After smoothing with edge tools, you may want to give the entire edge a light sanding with P220-grit to achieve a consistent surface.



Different Spin on Drawers

Add a twist to your furniture with a swing-out drawer

BY GARRETT HACK



I'm always trying to find amusing and different ways to incorporate drawers into my furniture. I've even made a drawer within a drawer. But one of my favorites is a drawer that spins out. Its surprising opening action is simply fun. Spin-out drawers work well in a square opening, as I'll demonstrate here, but they're also useful in situations where traditional slides and guides would be cumbersome, such as in a curved cabinet, where the pocket isn't rectangular. However, because the single pivot point replaces traditional runners, this drawer design is meant for light-duty work.

The challenges in building a spin-out drawer are drilling a precise pivot hole in the drawer front, laminating the curved

side to the right shape so that the drawer opens without binding, and cutting joints for a non-rectangular drawer. I enjoy the process. I'll illustrate it from start to finish using a small table as an example.

When incorporating a spin-out drawer into a piece, you need to start with a plan, or top, view of the drawer pocket. This drawing will guide all the work, from locating the pivot point to making the curved form to laying out the joinery.

Set up the pivot point

For the pivot pin, you can use a brass rod or even a 16-penny nail. Size the hole so that the pin fits snugly but is still able to turn. To ensure that the pivoting action is

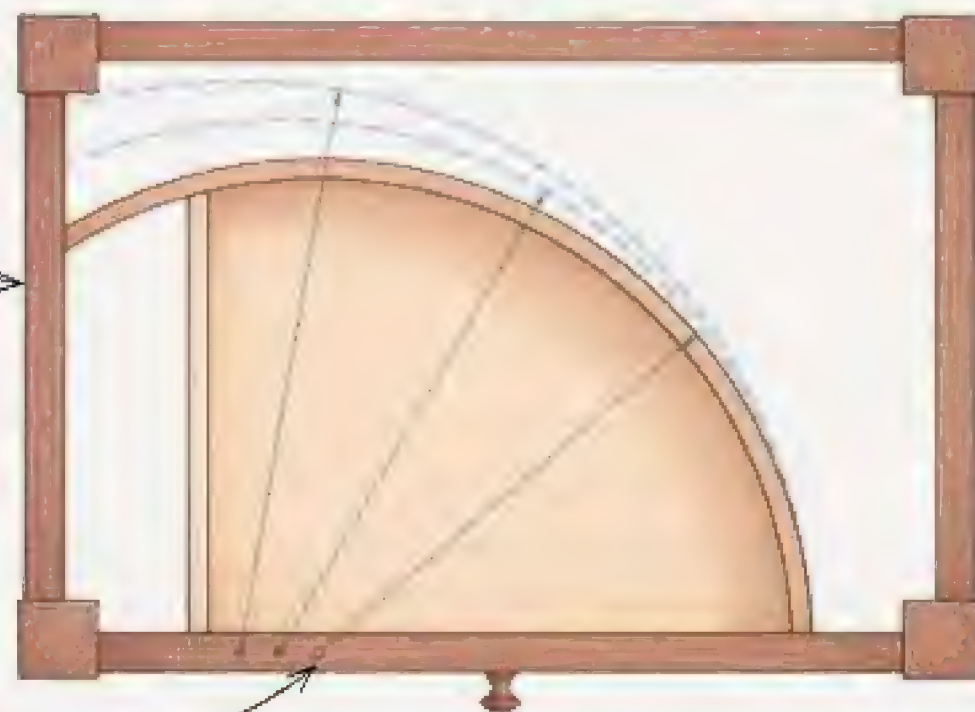
TOP VIEW PLANS THE ACTION

A top-view drawing of the drawer pocket is critical to laying out and drilling the pivot point in the front apron and drawer front. It also determines the bending form for the curved drawer side, and it is vital to finding the lengths of parts and the angles at which they meet.

TOP VIEW

Side apron serves as stop.

Moving pin toward the center creates better balance, with less stress on pivot. The trade-off is a smaller drawer box.



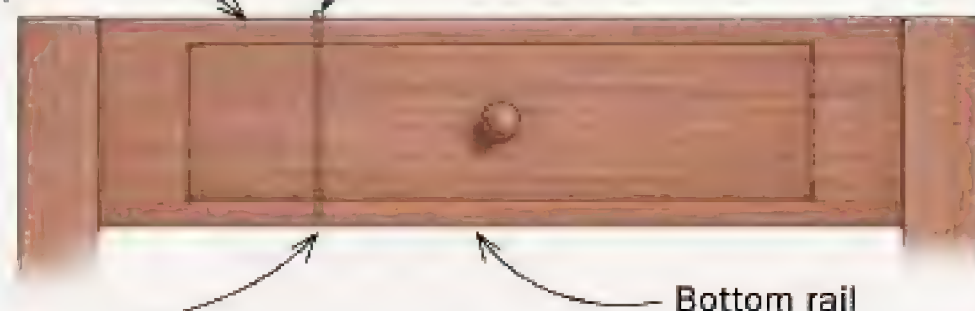
FRONT VIEW

Leave $\frac{1}{8}$ in. of material at bottom of pin hole.

Top rail

Leave pin proud at top so it can be removed. Cut recess into top for it.

Bottom rail



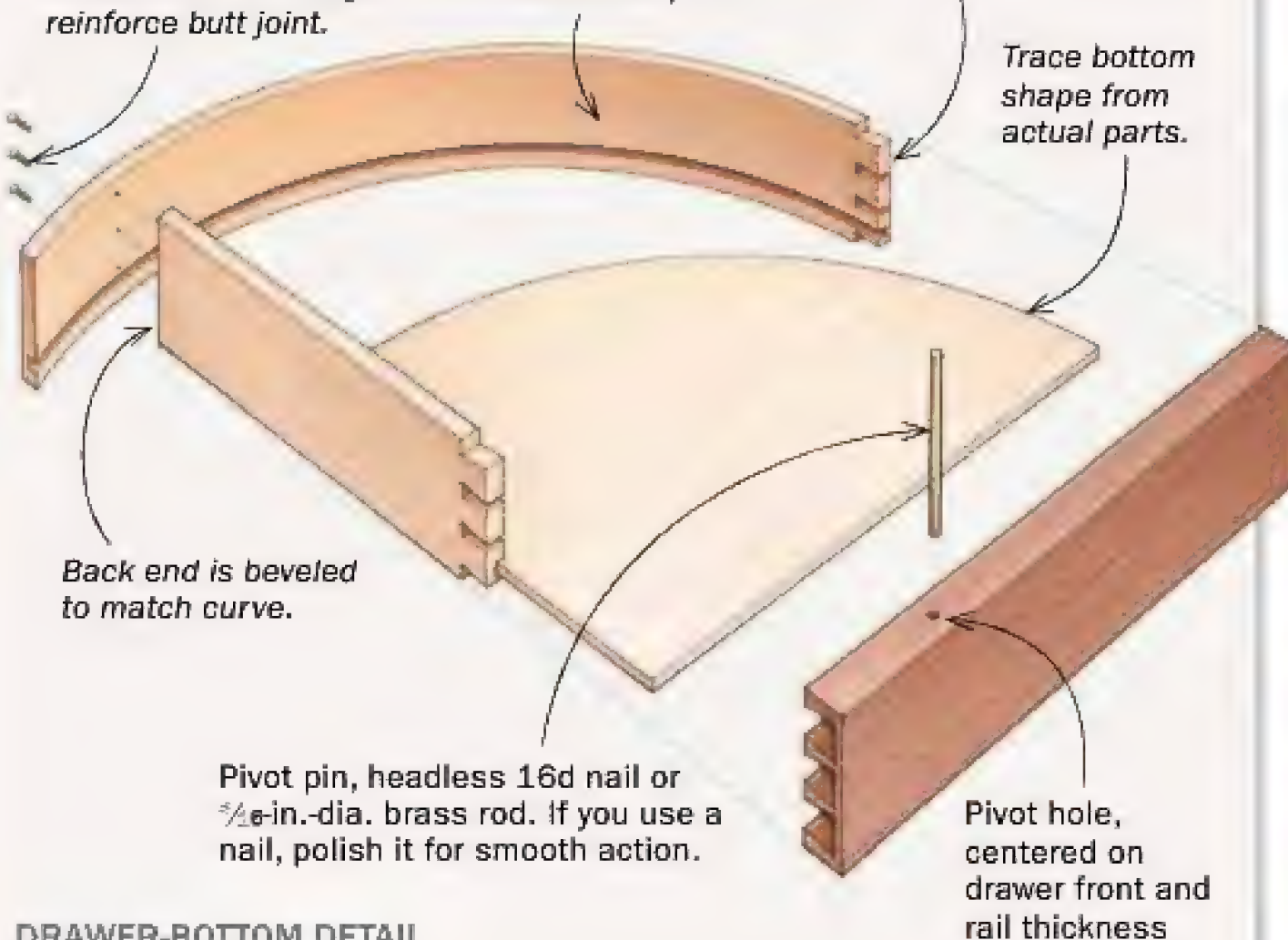
DRAWER CONSTRUCTION

#4 screws, $\frac{5}{8}$ in. long, reinforce butt joint.

Curved side is laminated from $\frac{1}{4}$ -in.-thick plies.

This dovetail joint is angled slightly.

Trace bottom shape from actual parts.



Back end is beveled to match curve.

Pivot pin, headless 16d nail or $\frac{5}{16}$ -in.-dia. brass rod. If you use a nail, polish it for smooth action.

Pivot hole, centered on drawer front and rail thickness

DRAWER-BOTTOM DETAIL

$\frac{1}{12}$ -in. gap for expansion

Drawer bottom



DRILL A PERFECT PIVOT

For smooth action, you must drill the pivot hole straight and true. Hack gets it perfect by drilling through all the parts at once.



First, cut out the front. Rip and crosscut the drawer front from the apron board. This method also yields a perfect grain match between parts.



Glue the apron back together. Insert the drawer front in the opening and push the ends of the apron in until you get a snug fit. Then tighten the clamps.



Drill the pivot hole. After cutting the apron joinery, clamp the apron and drawer front to a tall fence that's squared to the drill-press table. You'll need a long bit, but don't go all the way through. Leave at least $\frac{1}{8}$ in. of material between the bottom of the pin hole and the bottom of the lower rail.

EASY WAY TO BEND WOOD

Hack makes the curved side by bending and laminating bandsawn plies on a form. His form is a glued-up block of pine, shaped to a smooth curve. He makes the arc of the curve more severe to allow for springback, and relieves the inside edge for clamping.

MAKE THE FORM



Cut out the curve. With the pattern attached to the blank, rough out the form. Make sure that the bandsaw table is square to the blade.



Fair the edge. Smooth the form's curve using a block plane. Be sure the curved surface remains square to the top and bottom faces.

LAMINATE THE PLIES



Resaw madness. Make each layer roughly $\frac{1}{8}$ in. thick, $\frac{3}{4}$ in. to $\frac{1}{2}$ in. wider than needed, and 2 in. longer. Rejoint the stock after each cut.



Erase sawmarks. Use a smoothing plane to clean up the sawmarks on the resawn face of each lamination.

smooth, the hole must be perfectly vertical and centered in the thickness of the apron. To do that, I drill through all the parts at the same time, clamping the assembly to a fence on my drill press (see photos, p. 57). Now it's time for the curve.

Laminate the curved side

To make the curved side, you'll need to make a small bending form, based on the plan view. When laying out the arc for the form, I tighten the bend at least $\frac{3}{16}$ in. on each end to allow for springback (when the arc of the laminations flattens out after unclamping from the form). Trace the arc, exaggerating the bend as mentioned, and attach the drawing to the blank. Cut it to shape on the bandsaw and fair the shape with a block plane. Be sure to keep the form's sides perpendicular to the top and bottom as you fair it; otherwise, you'll introduce twist in the lamination. Once you have the outside curve nice and smooth, cut away the inside of the form, roughly parallel to the outside, to give a solid registration point for the clamps.

I resaw the $\frac{3}{4}$ -in.-thick plies on the bandsaw. To laminate the side I use yellow glue, which has a limited open time. But with such a small lamination, the short open time isn't an issue.

Once the glue dries, true up one edge of the lamination. I often joint the edge with a handplane, but a jointer works too. Now rip the lamination to rough width on the bandsaw, running the jointed edge

Bend away. After brushing glue on to the plies, use a flat benchtop to align them with the bottom of the form, then clamp them in place.

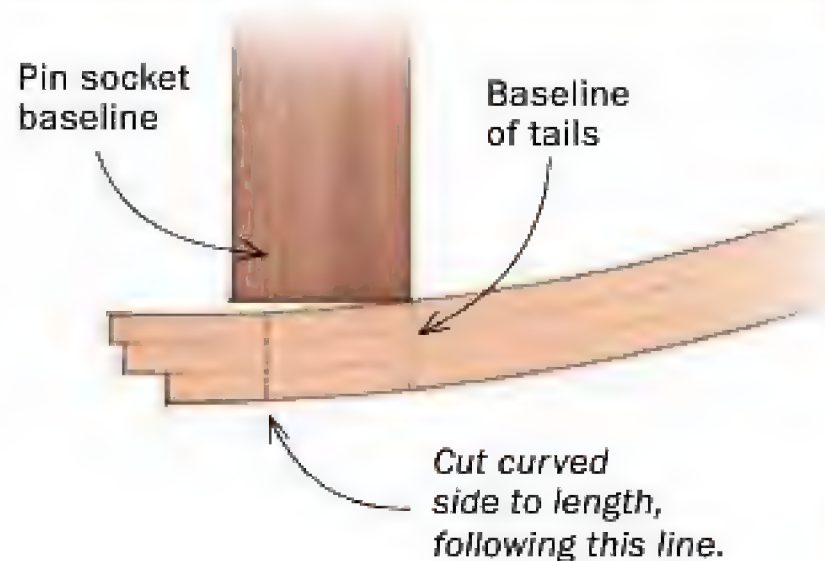


Rip it to width. Cut the curved side to width on the bandsaw and clean up the edges with a jointer or handplane.

CUT THE FRONT AND CURVED SIDE TO LENGTH

The curved side and the drawer front meet at a slight angle. Hack angles the end of the drawer front with a block plane and cuts the side to the right length and angle using a handsaw.

LAY OUT THE DRAWER SIDE LENGTH



against the fence. Cut the straight side of the drawer to width, and you're ready to work on the joinery.

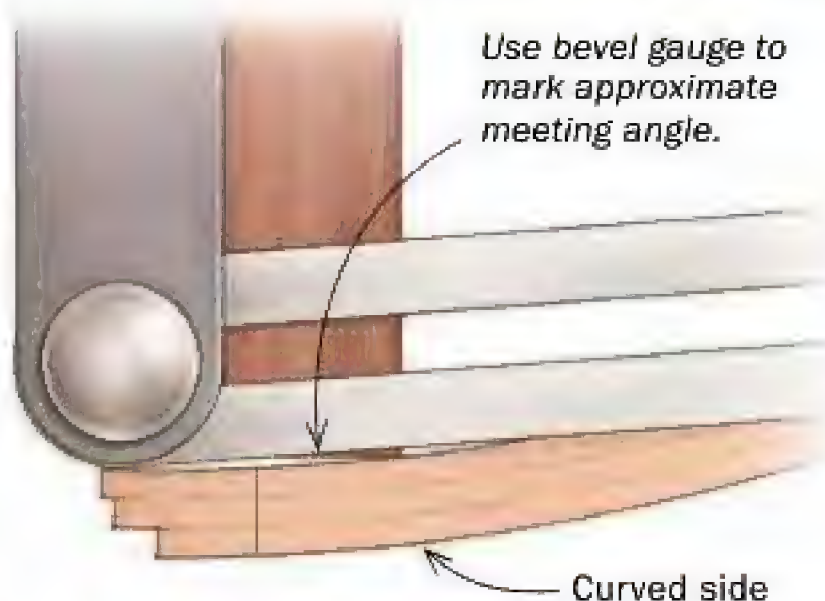
One angled dovetail joint

The curved side meets the drawer front at an angle, which means the dovetails are angled, too. Before you cut the joinery, though, you have to trim the parts at the correct angle (see photos, right).

Align the parts on the top-view drawing. Mark the baseline of the pin sockets on the drawer front and transfer that mark across the curved side. Use a square to bring those lines all the way around the side.

Now use a bevel gauge to scribe the approximate meeting angle of the two parts on the end of the drawer front. Plane the front to those marks. Use a crosscut saw to cut the curved side to length, following the layout lines. Clean up the cut with a block plane. Lay out and cut the joint by hand

MARK THE DRAWER-FRONT ANGLE



Use the plan view as a guide. Place the front and curved side on the plan (top) view. Mark the baseline of the pin sockets on the front and put a tick mark on the top edge of the curved side.



Continue the line. Extend the mark across the top edge of the curved side (left), keeping the rule parallel to the face of the drawer front. Then bring the lines all the way around the side using a square (right). You'll follow these lines as you cut the side to length.



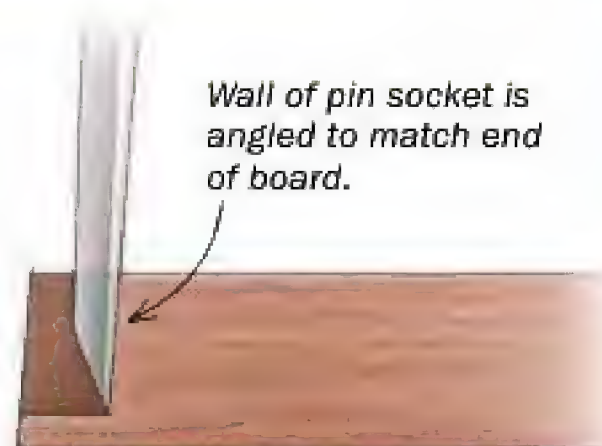
Angle the front. Use a bevel gauge to mark the angle on the end of the drawer front. (You'll use the same setting to mark the inside wall of the pin sockets.) Extend the line around and plane the end flush to it (right).



HANDWORK BEST FOR ANGLED DOVETAILS

The best way to cut the angled dovetail joint where the curved side meets the front is by hand. Chop and pare the pin sockets at an angle, then lay out and cut the tails.

ANGLED SOCKET



Wall of pin socket is angled to match end of board.



Chop and pare. Hold the chisel at an angle and follow the layout lines carefully. If needed, you can use a bevel gauge to eyeball the chisel angle.



VIDEO WORKSHOP

To watch Hack build a splay-legged version of this table, go to FineWoodworking.com/extras for a members-only video series.



Mark the tails. Cut the curved side to length, which is best done with a handsaw, then scribe the baseline of the tails. Clamp the drawer front vertically to mark the tails. Don't forget to cut the normal half-blind dovetails on the other end of the drawer front and transfer their layout to the straight drawer side.

(see photos, left), starting with the pins. After you finish the curved side, dovetail the straight side to the front.

Trapped bottom eases assembly

I used to notch the curved side and slide the bottom in, but I wasn't happy with the process or the look. A better way is to make the drawer with a trapped bottom, allowing it to float in its grooves and leaving enough room for expansion—a gap of $\frac{1}{32}$ in. to $\frac{1}{16}$ in. in each groove, depending on the season. Overall, this method creates a stronger drawer box and also makes the glue-up easier, as the bottom helps stabilize the assembly.

To make the bottom, dry-fit the front and curved side and trace their inside profiles on the stock. Now dry-fit the straight side to the drawer front and lay the assembly along the layout marks on the bottom. Make sure the front corner is square, then trace a line inside from front to back.



Cut the tails. Cut to the baselines on both drawer sides, clear the waste with a coping saw, and pare with a chisel.



A nice fit. With careful handwork, you'll have perfect joints in no time.

FIT THE DRAWER BOTTOM

The most precise way to cut the drawer bottom is to first trace the drawer's shape on the stock using the dry-fitted parts. Don't forget to add the groove depth.

Trace the dry-fitted parts on the drawer bottom. Extend the lines to account for the groove depth. Use the first mark to cut the straight side to length, then bandsaw the bottom to size.



Curves need a curved fence. The bottom grooves are cut with a three-wing cutter. For the curved side, Hack uses a fence that's shaped to match the inside curve of the side. A finger-board clamped to the router table ensures a consistent depth.



Now's a good time to mark and cut the straight side to length. Use a block plane to bend the end of the side so that it meets the curved side seamlessly. Once that's done, cut the grooves in the parts and cut and fit the bottom to them. After that, drill the hole for the pull and glue and screw the drawer together.

Get spinning

With the drawer built, cut the end of the curved side to length so that the front is flush to the rails (see photo, right). Now put the drawer in the opening, with the pivot pin in place, and test the action. Use a block plane to fix any binding and to fine-tune the end of the curved side so that the front is perfectly flush.

Now install a pull, and I'm sure you will open your drawer more than a few times, intrigued with its fun action. Your friends and family will, too. I guarantee it. □

Contributing editor Garrett Hack is a woodworker in Thetford Center, Vt.



Rear reinforcement. Once the drawer box is glued up, screw the curved side to the straight side.

FINE-TUNE THE FIT



The side apron is the stop. To ensure that the drawer front is flush with the rails, place the drawer on top and insert the pin. Align the front flush, and mark the curved side where it meets the side apron. Cut the side with a handsaw and then trim the cut with a block plane until the drawer front is flush when it's closed.

Choosing and Preparing Veneers

The first steps matter most

BY CRAIG THIBODEAU



By the roll or by the sheet. Straight-grained veneer most often comes in rolled-up leaves, up to 10 ft. long (above). Fragile burls are packaged and shipped flat (right) to prevent damage. Veneers are available in a huge variety of species (below) that you can't find readily as solid stock.



Veneer offers a wide range of furniture design possibilities because it comes in many sizes, figures, and wood types—many more than can be found in solid wood. With a vacuum bag, it's easy to make veneered doors, panels, cabinet tops, and other components. But the first step in working with veneer is learning how to purchase, cut, join, and seam sheets of veneer to get ready for glue-up.

Commercial veneer—a forest of options

I almost always use commercial veneer—instead of the thicker veneers some woodworkers saw themselves. The pre-cut product is more convenient, and it offers consistent thickness and a wider variety of species and sizes. You can buy commercial veneer with a paper backing or in “raw” form without a backing. I prefer the raw variety because it lets me use both faces of every leaf to create decorative matches. It's possible to buy a stack of veneer leaves cut consecutively from the same log for beautiful matching patterns. Raw veneer is also thicker



Out of the box

The first steps are marking the leaves for reference, taping up any checks or splits, and flattening.

MARKING AND MENDING

Mark the flaws. Thibodeau scans each sheet for knotholes, cracks, and other defects, circling each with chalk so he can repair them with tape or trim them away later.



Basic prep. Number the sheets in sequence to keep them in order for matching. The ends of long, rolled sheets often suffer from checking. Blue painter's tape prevents the checks from growing.

FLATTENING



Flatten a wavy burl. Thibodeau soaks bumpy sheets with commercial flattening solution, puts brown paper between the sheets, and then puts them between MDF cauls in the vacuum press for 30 minutes.



than backed veneer, leaving more room for sanding or mistakes. Buying commercial veneer typically means buying online. Look for a dealer that specializes in veneer, with a website that provides photos of actual inventory.

How much is enough?

First, create a project cutlist to determine how much veneer you'll need. Measure the overall size of each veneered panel in the piece (veneered on both sides), add a couple of inches to the length and width of each panel for trimming and sizing, and add up the total.

For panels that need a decorative match, specify the number and size of matching leaves needed to create it. Also note any pairs of panels that need to be identical, like opposite sides of a cabinet or two matched doors. You'll need twice as many matching veneer leaves to make each set. Because of



Still wet. When the damp burl first comes out of the press, it is supple like leather. Keep changing the paper and repressing for a few hours at a time until the paper comes out dry.



Trimming and taping

An invisible seam requires straight, clean cuts and two types of tape.



Align the leaves. For a pair of book-matched glue-ups, Thibodeau aligns a set of four leaves, using an easily identified feature like a pin knot or swirling grain line shared by all four (top). Tape the stack together in that alignment and cut the seam with a sharp veneer saw.

Joint the edges. After cutting the seam edges, joint them square and smooth with P150-grit sandpaper mounted on a long, flat block.

this, the final number of leaves is as important, or more so, than the total square footage. Last, buy extra to prepare for mistakes and the unexpected. I add up to 20% for straight-grain veneers and up to 50% for figured or burl veneer, making sure the extra leaves are from the same consecutively cut bundle. The extra cost is easier to bear than trying to restock in the middle of a project.

Preparing veneers

Except for burls, veneer is typically shipped in rolls. When you're ready to use your veneer leaves, unbox and unroll them and give them a little while to relax back into a mostly flat state. Mark any defects such as cracks and splits with chalk. The leaves come

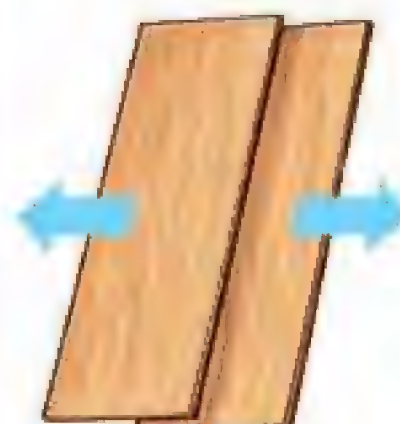
stacked in the order they were cut. Label one end of each piece for reference, numbering them sequentially. This keeps them in order as you flip them around looking for the perfect match.

Veneer is fragile stuff. Burls may have some breakage or cracks depending on how well they were shipped. Typically the ends of straight-grained veneers have some cracks or splits that can be taped together as you would a jointed seam (see above). But even if the veneer is not damaged, tape helps prevent splitting. Carefully tape back together anything that is broken, just in case you need it later. Also tape around the perimeter of the burls to prevent more breakage during shuffling and sorting. Even with these steps, be prepared for a few inches of waste on each end.



SLIP-MATCH

This match marries identical or similar leaves oriented in sequence. The match can create an appearance of continuous grain, or of a repeating pattern (as in the sideboard at left).



BOOK-MATCH

This match consists of two consecutive, eye-catching leaves oriented to mirror one another. It is ideal for door panels, tops, or even drawer fronts (as in the game table shown here)—any place that calls for decorative symmetry.





Blue tape first. Blue painter's tape has a little stretch to it. Pulled taut across the seam, it retracts slightly after being pressed down, helping to pull the joint tightly together.



Burnish it. Thibodeau uses a brass brush to press the tape down firmly and ensure that it won't loosen.

Keeping veneer in good shape long term calls for very consistent humidity and temperature, something most home shops can't provide. Sandwiching veneer—especially burls—between sheets of MDF can help protect it from the environment.

The perfect shape? Flat

To get a smooth, unblemished surface on your work, the veneer must be flat. You can press mildly wavy veneer, but buckled or heavily distorted pieces need flattening first. To do this, thoroughly dampen both sides with flattening solution. Let the moisture penetrate for a few minutes, then lay each piece of veneer between sheets of brown paper and put them in a vacuum press between 1/4-in.-thick MDF cauls. You can stack several layers to save space as long as there's paper between the layers.

Keep the veneer under pressure for roughly 30 minutes, then change the soaked paper for fresh sheets. It is important that the veneer be dried thoroughly, because veneer that's damp at glue-up may shrink at the seams afterward. So leave the veneers in the press and continue changing the paper every few hours until the paper comes out dry. Now put the dried veneer between sheets of MDF to keep it flat until it's ready to be used. Don't leave flattened veneer uncovered very long or it will distort again and you'll need to repeat the flattening process.

Put the pieces together

Book- and slip-matches in straight-grain veneer are the most basic decorative matches, and they are a great place to begin. A simple way to visualize a book-match is to hold a mirror vertically along the proposed joint. The reflection will show the mating side of the match. Slide the mirror around to find different patterns. Once you've found the perfect pattern, mark the seam with pencil or chalk along the mirror edge.



Then veneer tape. On the show face of the joint, Thibodeau applies a non-perforated paper tape with a water-activated gum adhesive (above). Let the sheet dry under a piece of MDF before removing the blue tape on the glue face (below).



Creating a four-way match

After you've done a book match, go to the next level with a four-way match. It starts with four consecutive leaves. Tape them up in two book-matches, then book-match the results.



Beauty squared. The top for this dining table was glued up with a four-way match of elm burl. The match consists of four consecutive leaves oriented so that each leaf mirrors its neighbors.

To cut the seam for a decorative match, the veneer leaves must be stacked and aligned precisely. Look for telltale grain markings that appear on each leaf and line them up leaf by leaf in the stack. Tape the stack together at this spot, then move to another and repeat. With the stack aligned and taped, you're ready to cut.

To ensure a straight, tight seam, use a high-quality veneer saw and a straightedge cutting guide. A straight length of square stock works well. Glue some P100-grit sandpaper to the bottom for a

Online Extra

For tips on sharpening a veneer saw and getting the most from your vacuum press, go to FineWoodworking.com/extras.

good grip. Finally, a self-healing mat like those used for sewing lets you cut deeply while hugging the straightedge.

Gradually cut through the veneer stack. Let the saw do the work and don't force the cut. It may take a couple of passes. Afterward, use a straight, flat sanding block to remove any roughness or tearout on the edges. Slide the cut edge of the stack off the edge of your bench ¼ in. or so and hold the stack tight by pressing down with a straightedge. It should take only a couple of passes with the sanding block to joint the cut edge. Repeat the process on any other edges that need cutting.

Remove the tape and lay out the leaves as they will be joined with the show face down. Use blue tape to pull the joints tight. Flip the sheet over and apply gummed veneer tape to all

Mirror trick. On a single sheet of burl, Thibodeau uses a pair of hinged mirrors to scout out an eye-pleasing pattern.



1

the joints. Wet the tape on a moist sponge and quickly lay pieces along each of the joints. Wipe over each joint with a paper towel to press down the tape and remove any residual moisture in it. Once all the joints are taped, cover the veneer with a piece of MDF until the tape is dry, then flip the sheet and remove the blue tape from the glue face. The veneer is now ready for glue-up.

A four-way match in flattened burl

A four-way match is two book-matches that are then book-matched to each other. First, use two mirrors taped together and held at 90° (a drafting triangle helps) to find the best orientation. Then mark both edges along the mirror with chalk. Stack the four pieces of veneer in order and tape them together, then trim the stack about ½ in. outside the marked chalk lines. Untape the stack and begin aligning the four leaves using the grain markings to orient the pieces. Then retape the stack and cut through both chalked lines. Lightly joint both cut edges with the sandpapered block.

Untape the stack again and flip some of the pieces over to see how the book-matched pieces fit together. Start by aligning the grain to create the two-piece book-matches. You may need to shift the veneer a bit from side to side to get the best match. Don't worry about any mismatch at the other seam; you'll be re-cutting the final joint. Secure the first two joints with blue tape (this is the show face), then flip the pieces and fully tape the seams on the glue face with tape across the joints and down the length of the joints. Flip the two pieces and remove the tape from the show face.





Now line up the last seam. If it doesn't match perfectly, stack the two pieces and align the grain markings at the seam as before, then cut both pieces at once to get a matched seam. Joint the edge with sandpaper and lay the pieces out again to check the seam. If the grain lines up properly, you're ready to tape the joint. Once you've used the blue tape on all the seams on the glue face, clean any remaining blue tape off the show face and trim the veneer to close to its final size. I typically leave veneer sheets about 1/2 in. oversize for pressing and do the final trimming after glue-up. Veneer-tape both seams. Slide the veneer under a piece

of MDF and when it's dry, remove the blue tape from the glue face and you're ready to use it. □

SOURCES OF SUPPLY

VENEER

certainlywood.com
veneeronline.com

VENEER TAPE

34-gram white veneer tape, 20mm wide, veneersystems.com

FLATTENING SOLUTION

joewoodworker.com
vac-u-clamp.com

ARNO VENEER SAW

thebestthings.com



Craig Thibodeau is an award-winning furniture maker in San Diego.



2 **Trim the seams.** After aligning similar marks on all four leaves and trimming the first seam, Thibodeau uses a drafting triangle to align the straightedge squarely for the adjacent cut.



3 **Tape up the halves.** Secure the first set of book-matches with blue tape.



4 **Re-cut the second seam.** Align the figure along the second seam and trim it straight before taping it up.



5 **Tape up the last seam.** Pull together the last seam with blue tape as before. Then gum-tape the seams on the show face, let the sheet dry under MDF, and remove the blue tape.

A Journey to Bombé



Online Extra

For a visual history of the bombé, go to FineWoodworking.com/extras.

Veteran woodworker Dan Faia
plunges into the project of a lifetime

BY THOMAS McKENNA

On the surface, a bombé chest is a beautiful piece, with friendly curves on every side. But woodworkers know it's really a wolf in sheep's clothing. Those drastic swells confound traditional construction, creating a conundrum of surfaces that stymie every step of the way, from shaping the sides and drawer fronts to fitting the drawers. Even the hardware has to be shaped to fit.

As you might guess, not many craftsmen are willing to embark on this quest. But it's not just the technical aspects of the project; it's also the cost of the lumber. To achieve the carefully matched grain patterns on the sides and front, you need to

Staggering amount of stock removal

Cutting and milling the rough stock was the most physically demanding part of the entire project. The 12/4 board, from which Faia took all the case parts, weighed close to 350 lb. and was too big for a jointer or planer, so he did all of the flattening by hand. Luckily, he said, "I enjoy handwork, so it didn't feel too much like hard labor."



sculpt the parts from monstrous slabs of solid mahogany.

So I was thrilled when longtime *FWW* contributor Dan Faia told me he was commissioned to build a bombé for a local client. It is hard to imagine anyone better suited for the job. Faia has strong Boston roots, as does the American bombé, and possesses terrific technical skills with an attentive eye for detail. He also happens to run the Cabinet and Furniture Making program at Boston's North Bennet Street School.

It was a perfect storm for *Fine Woodworking*. We had a once-in-a-lifetime piece being built by one of the best period furniture makers in the country. So we decided to go along for the ride. This is a



Kerfs guide the work. Faia laid out the side profiles on the thick blank, then cut a series of tablesaw kerfs that would guide the sculpting to come.



Chop to the lines. Faia chipped away the bulk of the waste using a wide chisel and mallet. He followed with a travisher (inset) to rough in the curves.



Smoothing the rough spots. As the work became more refined, Faia faired the curves using a smoothing plane and a card scraper. At this point, the bull's-eye grain pattern really started to pop.

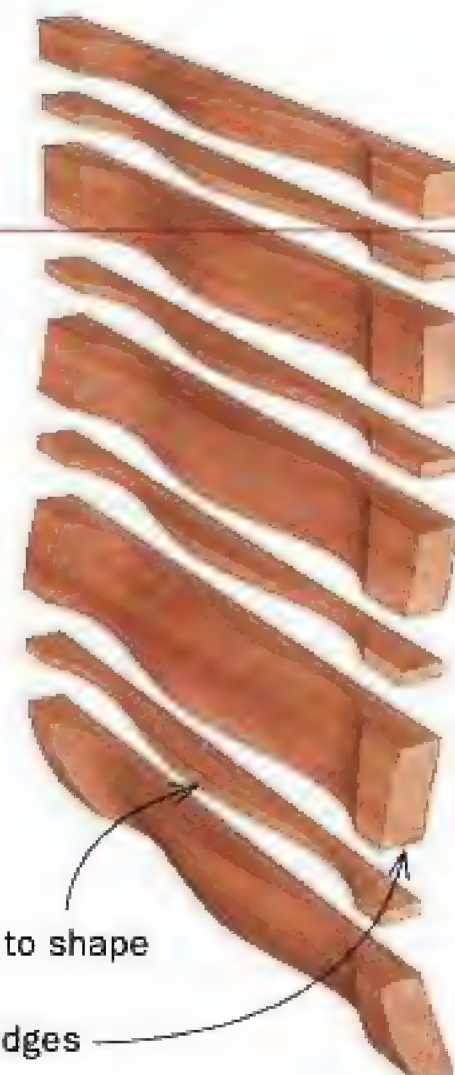


These dogs pinch. Faia spot-glued and clamped the parts, in sequence, on top of the supports and used pinch dogs to hold the components tightly together for shaping.

Drawers and dividers done as one

To ensure fair curves on the front of the chest, Faia shaped all the parts at the same time: drawer fronts, dividers, even the fretwork molding at the top. He sandwiched the pieces on a pair of curved supports—shaped to match the curve of the sides—which later served as the rear supports for the drawer runners. He learned this clever technique from Lance Patterson, a colleague at North Bennet Street School.

Before placing the parts on the jig, Faia bandsawed the rough curve on the dividers to guide the drawer shaping. Each divider has its own pattern. He also beveled the edges of the drawer fronts to follow the curve of the cabinet sides.



Dividers bandsawn to shape

Drawer fronts beveled on edges



Heavy handwork. As with the case sides, waste material was hogged away with hand tools. The arsenal included a drawknife, chisels, a travisher, spokeshaves, and other handplanes. He started with the flatter sections at the outside of the drawer fronts.

brief account, in pictures, of Faia's long journey—so long you can see his beard come and go in the photos.

American bombés have Boston roots

"Many furniture makers are fixated on making their piece mimic the original," said Faia. "But I did not want to simply re-

create a piece that had already been done." Fortunately, his client gave him broad freedom to explore different options. But, he said, "it was important that I keep the details—and the construction—authentic to the period."

He pored over historical examples—in books and in museums—searching for

elements that he could incorporate, and trying to piece together the steps. It was like "CSI Boston."

Bombé furniture didn't originate in America, but the form was refined and perfected in Boston in the late 1700s. Many scholars believe it first appeared in the states in the Brattle Square Church,



3-D pattern has multiple uses. Once the end sections of the drawers were flush with the dividers, Faia used a 3-D pattern to mark where the serpentine shape begins (inset). The same pattern was used to mark the shape on the ends of the drawers and to lay out the front of each case side. Faia followed those lines as he sculpted the front of the case (right).



The church had a number of wealthy and politically influential members, such as John Adams and John Hancock. When the church was rebuilt in the late 1700s, its most prominent architectural element was the pulpit, which exhibited the iconic serpentine shapes of the bombé form.

Wealthy church members, eager to showcase their cultural status, commissioned local cabinetmakers to build pieces based on the pulpit's design. One of the most notable of these makers was John Cogswell, whose signature adorns many of the original bombé chests and desks still in existence.

Cogswell and other makers stepped away from the European take on bombé



Bull's-eye. As the shaping neared the end, the telltale bull's-eye grain pattern on the case front was revealed. A scraper handled the final fairing.

Crazy curves complicate assembly

Once the shaping was done, Faia cut all of the carcase joinery. The bottom is joined to the sides with half-blind dovetails. The top and dividers connect to the sides with sliding dovetails. The fretwork molding is mitered into the case, while the lower egg-and-dart molding in front of the pine bottom is dovetailed. Before glue-up, he carved the fretwork pattern into the sides.



Does it fit? Before shaping the top, Faia dry-assembled the case to make sure all the joinery was perfect (above). Then he band-sawed the top to shape and used the router table to cut the edge profile. He used custom scrapers to give the routed shapes a hand-cut look and feel.



Time for glue. The top and bottom were glued to the sides first. Then Faia installed the drawer dividers (left). Last to go on was the fretwork molding (below; for more on that detail, see p. 74).

pieces, where the swelled case sides were shaped from narrow boards that were coopered together and then covered with veneer. American makers, in a nod to the wealth and prosperity of their clients, built their chests out of solid, thick slabs of plentiful mahogany. They adorned the pieces with opulent hardware and occasionally incorporated fine carvings, such as ball-and-claw feet and leafage motifs.

Building drawers to fit these curvy cases was perhaps the greatest challenge, and makers came up with a number of solutions. Some made vertical sides, with the



pocket blocked out, or angled the sides inside the pocket. In both cases, the front was shaped to fit the curves. More complex designs featured drawers whose sides and fronts were shaped individually to fit the case. That approach was a hallmark of later Cogswell pieces.

No repeats

Faia began with a number of sketches. He wanted to incorporate period-perfect details, but the mix had to be right. "My intention was to replicate the very best elements of the very best period examples," he said.

His piece has roots in the original Cogswell chests. He sculpted the sides and the front parts (drawers, dividers) from solid mahogany. He shaped the drawer sides and front to fit the inside curves of the case. And he added ball-and-claw feet and leafage patterns carved on the knees and transitions.

But that wasn't enough. "To make my bombe different," he said, "I also incorporated a number of unique carving details, such as

Devilish drawers are tricky to fit



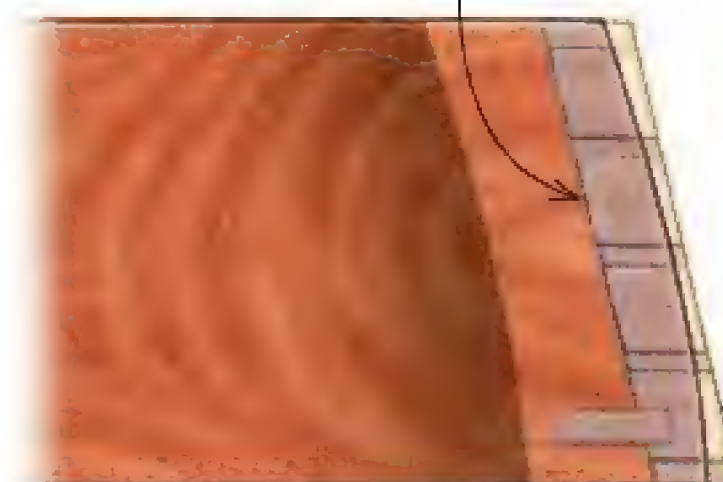
With compound-angle dovetails and rounded sides, the drawers were one of the most challenging parts of the piece. To top it off, each one has a different shape, requiring a different set of compound angles. After cutting the joinery, Faia shaped each drawer to fit its opening, one at a time.

Never-ending array of curves. Each of the dovetailed drawers has a different shape on the ends, requiring compound-angle joinery and meticulous hand-shaping and fitting on the sides.



Shaping needs a heavy hand. Faia used a smoothing plane to shape the drawer sides to fit the curved pocket. He started with heavy cuts and finished with light, smoothing cuts to refine the curve. He checked the fit often.

Compound-angle dovetails



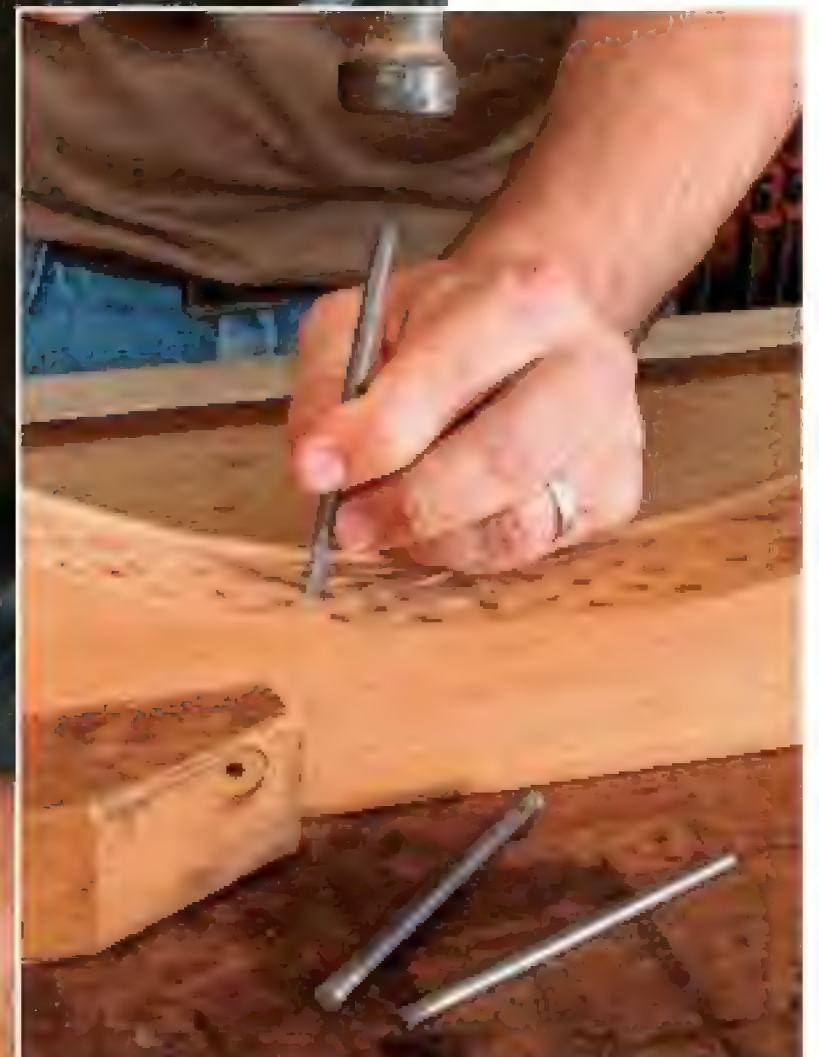
Sides and front are planed to fit the case curves.

Fretwork adds pizzazz

During his research, Faia had seen a few bombé secretaries and chest-on-chests with fretwork molding around their midsection and sometimes at the cornice. He liked the idea of fretwork at the top of the low bombé, but for this smaller piece he had to scale it down.

Worth fretting over. The fretwork molding at the top was a period-correct twist to Faia's bombé. The front is a separate molding, mitered into the case. The side patterns were hand-carved into the carcase.

In the zone. While carving, Faia followed a pattern marked from a full-size template. "It looks like a daunting job," he said, "but I find carving to be very meditative."



Knockout punches. To create the texture in the recesses of the fretwork, Faia used a series of custom punches he made using flat and triangular files.

Floor-level details are fantastic

Many original bombé chests had spare bases, with simple moldings and feet. Perhaps the makers believed the voluptuous shape and fancy hardware were enough decoration. But Faia loaded up on hand-carved details at the base to take his bombé to another level.



Boston ball and claw. With the side toes raking back, Boston feet are unique to the region. Faia borrowed the leafage pattern on the knees and transition blocks from an original piece at the Museum of Fine Arts Boston.



Creative corner. Eighteenth-century cabinetmakers often subbed out carving jobs to specialty shops. But Faia was a one-man show, handling both jobs with superb skill. The base carvings are a testament to that.



How do you like your eggs? Faia carved the egg-and-dart molding so that the corners would meet perfectly in the center of an egg. "It was time consuming," he said, "but in a piece of this magnitude, the details are everything."

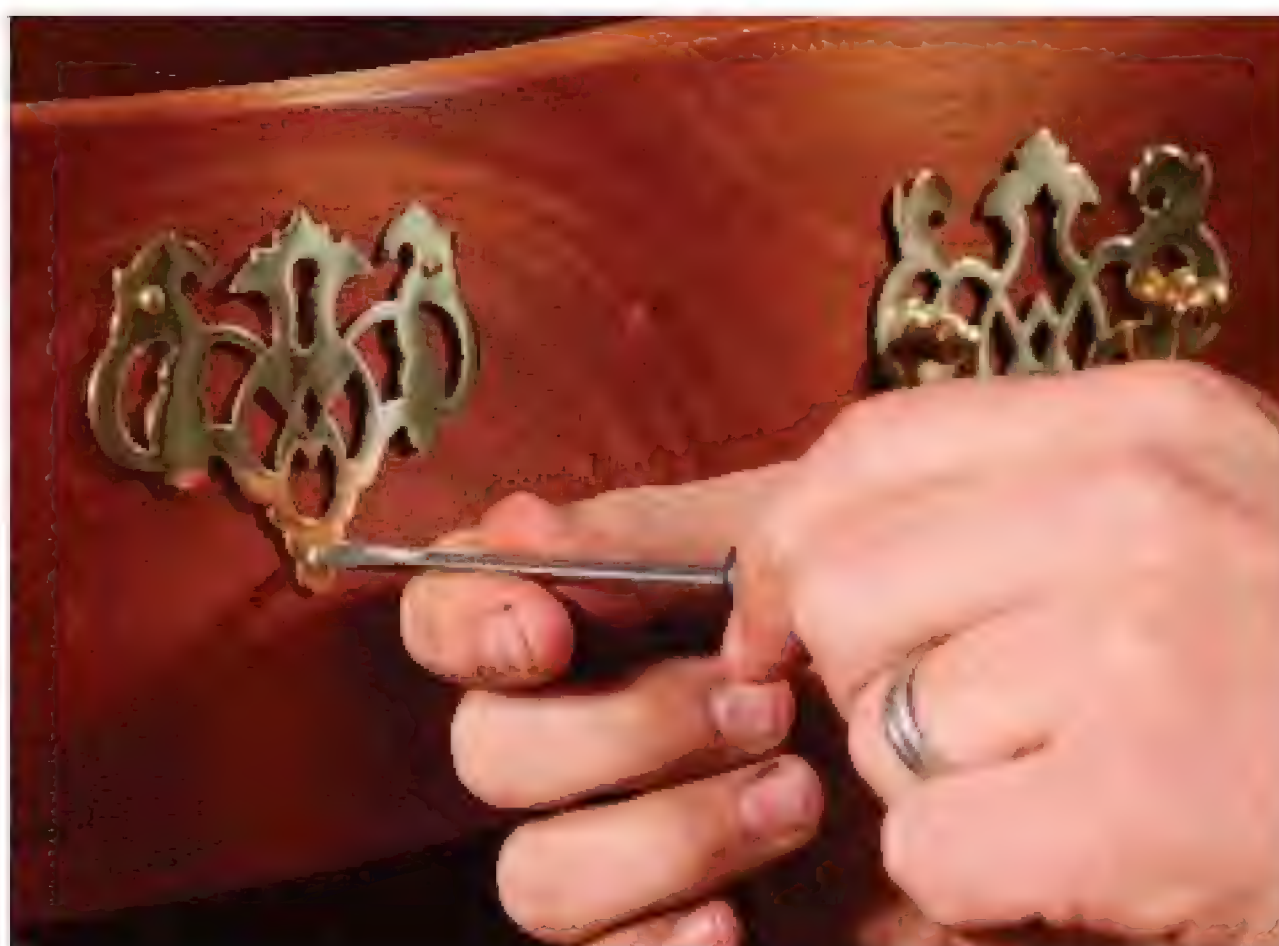
the fretwork at the top of the case and the egg-and-dart base molding."

Having settled on his savory stew of traditional details, Faia's next challenge was figuring out the steps. "The project required the greatest amount of planning of any piece I have ever made," he said. "Work sequences had to be well-timed for everything to come together right. I knew a mistake at any stage would be devastating."

Faia figured it all out, and when he was finished, he was as understated as always. He didn't jump for joy. He wasn't interested in a high-five or a flying chest bump. He said, "I'm happy with it. It came out pretty good." □

Thomas McKenna is managing editor.

Even the hardware has curves



Pulls must be shaped to the case. Faia had to shape the brass hardware to fit the front. He placed each piece on a curved pine block and tapped it into shape using a deadblow mallet. And the pilot holes had to be perpendicular to the curve at each location, or the screw heads wouldn't sit flush.

readers gallery

DALE JOHNSON

St. Francis, Minn.

Inspired by a visit to his daughter's small apartment, Johnson designed this desk to help keep things organized. The desk (24 in. deep by 42 in. wide by 40 in. tall) is made of figured red oak, figured cherry, and rosewood. It has places for papers, envelopes, a laptop computer, and even a plant or two. The finish is alkyd varnish.

PHOTO: MICHAEL HECKER



ANDREW PRIOLI

Chapel Hill, N.C.

As a student in the furniture department at the Rhode Island School of Design, Prioli was given five weeks to design and build a piece of furniture that included bent lamination or steam-bending. In designing this black walnut chair, he paid close attention to seat angle and height, plus other ergonomics and proportions that make a chair comfortable. Prioli made the chair (18 in. deep by 15 in. wide by 20 in. tall) using bent lamination and finished it with spray lacquer. PHOTO: MARK JOHNSTON

ARTHUR W. KEENAN

Saugus, Mass.

Keenan wanted to learn how to veneer curves, so he made this dressing mirror (13½ in. deep by 21 in. wide by 30 in. tall) while a student at the Furniture Institute of Massachusetts. It is a copy of a Samuel McIntire piece and is made of Eastern white pine and covered with African mahogany crotch veneer. Keenan also wanted to expand his carving abilities, and the mirror stands gave him the opportunity. The finish is French polish.



FINE WOODWORKING IN ORANGE COUNTY

The OC Fair Fine Woodworking Competition is held every summer in Costa Mesa, Calif. The 13th annual show last July and August had more than 275 woodworking entries. Here are some that caught our eye.

JOHN SPARROW

Orange, Calif.
Industry Award Winner

The curved legs on this dining table (48 in. dia. by 30 in. tall) and chair (22 in. deep by 20 in. wide by 42 in. tall) are made with bent-laminated hard maple. For the chair seat and back, Sparrow made his own plywood and molded it to form the curves. He likes to use laminations and plywood because it allows him to fabricate forms not possible with solid-wood construction. The tabletop includes fiddleback maple and padauk veneers, arranged in a sunburst pattern. Sparrow finished the pieces with lacquer.



KEN COWELL

Yorba Linda, Calif.
Division Winner, Wood Turning

When Cowell began turning segmented vessels in 2007, he wanted to move away from traditional Southwestern design. Inspired by the Arts and Crafts movement, he developed his own voice in that style. This segmented vessel (12½ in. dia. by 16 in. tall) is made of curly maple, ebony, and Carolina cherry burl. Cowell finished the piece with Waterlox.



LEONARD MUSGRAVE

Orange, Calif.
First Place, Wood Turning

When Musgrave became interested in decorating his thin turned bowls with piercings, he bought a small, pneumatic high-speed grinder (similar to a dental drill) and got to work. His 40-year-old compressor had trouble keeping up with the grinder's air demand, so the piercing was slow going. But he got the effect he wanted. This kiln-dried poplar bowl is 11 in. dia. by 3 in. tall, and just ¾ in. thick. It is finished with a spray sanding sealer.



LAURA ZAHN

Los Angeles, Calif.
First Place, Furniture

This "Table for Two" was designed with the tight living spaces of urban dwelling in mind. Made of jatoba, kwila, and apple plywood, the table (33 in. deep by 35 in. wide by 29½ in. tall) allowed Zahn to practice the techniques she was learning at the College of the Redwoods, such as veneering, bent lamination, and shaping legs. This was Zahn's second project at the school. She finished it with varnish.



MICHAEL FORTUNE

Lakefield, Ont., Canada

This walnut hall table (12 in. deep by 72 in. wide by 32 in. tall) is made from a salvaged city tree. Fortune, a *FWW* contributing editor, had to work carefully around the clothesline hooks, pulleys, and gate hinges that he found embedded in the wood. To make the circular stand, he steam-bent a piece—2½ in. thick by 4 in. wide by 106 in. long—around a 10-in. radius form. Bending the substantial stock required a lever 17 ft. long, and three people to pull it. The top is made with MDF and walnut burl veneer salvaged from an airplane interior. The table is finished with catalyzed lacquer and includes ebony details.



STEVE BUTLER

North Uxbridge, Mass.

Butler has always liked the simplicity and minimalism of postmodern design. In his chest of drawers (18 in. deep by 30 in. wide by 72 in. tall), he added a dash of period style. The broken arched pediment was inspired by Queen Anne furniture and was formed with bending plywood. One arch is covered with aluminum laminate and the other with beech veneer. The case is made of solid European beech on a poplar frame. The drawers have a cock bead made of solid aluminum bar stock, profiled with a roundover router bit that he threw away afterward. Butler finished the chest with catalyzed lacquer.



Submissions

Readers Gallery provides design inspiration by showcasing the work of our readers. For submission instructions and an entry form, go to FineWoodworking.com/RG.

DESIGN SPOTLIGHT

MOLLIE FERGUSON

Oakland, Calif.

In the wood room at the College of the Redwoods, Ferguson found a plank of olive that would be perfect for the silverware chest (12 in. deep by 18 in. wide by 5 1/4 in. tall) she was planning to make for her mother. She liked the color and grain, which combined creamy sapwood with streaky, almost sedimentary heartwood. The plank wasn't huge and it had some defects, so she conserved it by slicing it into veneers. She used teak to build the carcass, the base, and the trays inside.

To make the olive grain wrap around all four sides of the box and turn the corners seamlessly, Ferguson used two consecutive slices of veneer—one for the front and left end, the other for the back and right end, staggering the crosscuts. She managed the layout so the horizontal seam for the lid would fall entirely in sapwood, leaving the striated heartwood undisturbed.

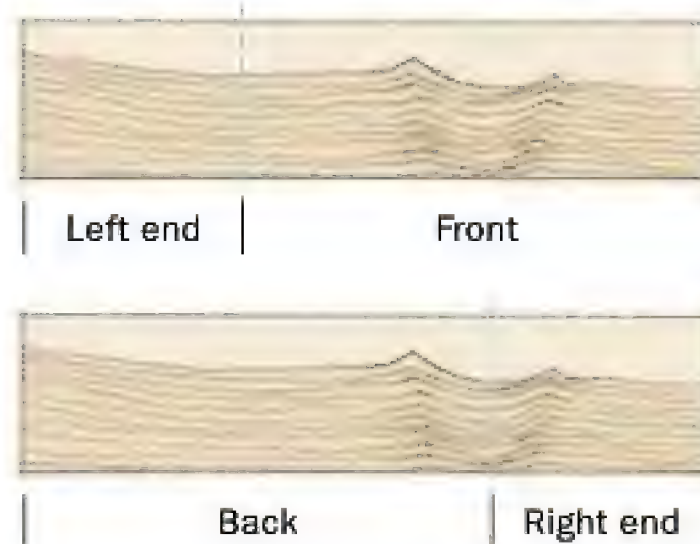
On the top, which she dished slightly from end to end to echo the long curves in the grain, Ferguson bookmatched two straight-grained slices of veneer, placing the sapwood so it carried over the front and back of the chest. Because bookmatched pieces can reflect light differently, creating a light-and-dark effect, Ferguson flipped one piece of veneer end for end so both pieces had the same face up, ensuring a consistent appearance in any light. She used ApplePly as a substrate for the lid and created the slight saddle with a coopering plane. She veneered the underside of the lid with teak. In a final homage to the grain pattern, Ferguson dispensed with a handle.



PHOTO: DAVID WELTER

GOING WITH THE GRAIN

Two consecutive slices of veneer create a seamless four-corner match.



SIDES OF BOX

Top slices are bookmatched to put sapwood at front and back.



One slice is flipped end for end so both slices have the same face up.

TOP OF BOX



YOSHIMITSU MOTOYAMA

Obihiro, Hokkaido, Japan

Motoyama has long admired the stylish strength of bridges. The construction of this hard-maple chair (47 1/4 in. deep by 28 1/2 in. wide by 36 1/4 in. tall) reflects that admiration. The curving main frames that support the chair are bent-laminated from 3/4-in.-thick maple strips and connected with mortise-and-tenon joinery. The finish is oil. The dyed cane seat is woven in the style of Danish furniture designer Hans Wegner.

Wooden box hinges

ADD ROUGH-HEWN CHARM TO YOUR CUSTOM BOXES

BY DOUG STOWE

Through the years, I've come to appreciate wooden hinges not only for their rustic beauty, but also because they are truly fun to make. They allow me occasionally to give up my dependence on the hardware store and mail-order catalog, to unhinge my creativity, and to say, "I made all of that, even the hinges." And that's a great feeling for a craftsman, new or old.

The technique I use to make wooden hinges isn't difficult. The two leaves pivot on a knuckle joint and are held together by a brass rod. I'll show you how to drill the hole for the rod and make the knuckles so that the hinge works smoothly. Once you have mastered the mechanics of the joint, you can have fun with the design.

Drill the hinge-pin hole

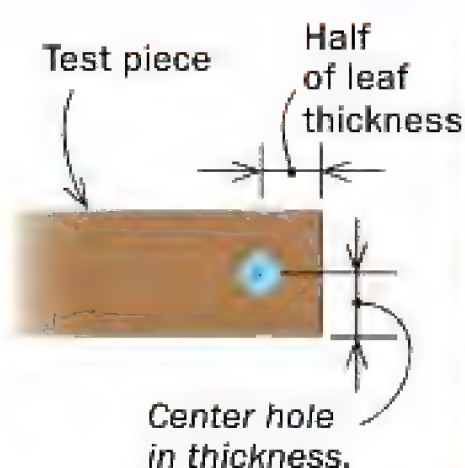
Before you drill the hole, there are two things to know about the hinge leaves. First, for strength, they should be no thinner than $\frac{3}{4}$ in. Second, their overall width is directly related to the width of the knuckles. There needs to be an odd number of knuckles on each hinge. I've found that $\frac{3}{4}$ -in.-wide knuckles are a good size for most box hinges. That means the overall width of the leaves needs to be an odd multiple of $\frac{3}{4}$ in.



Test piece ensures a perfect pin hole

Using a test piece the same size as the hinge leaf, Stowe sets up the drill-press fence to both center the pin hole and locate it from the end of the leaf. Use a short drill bit, which is less likely to wander than a long one.

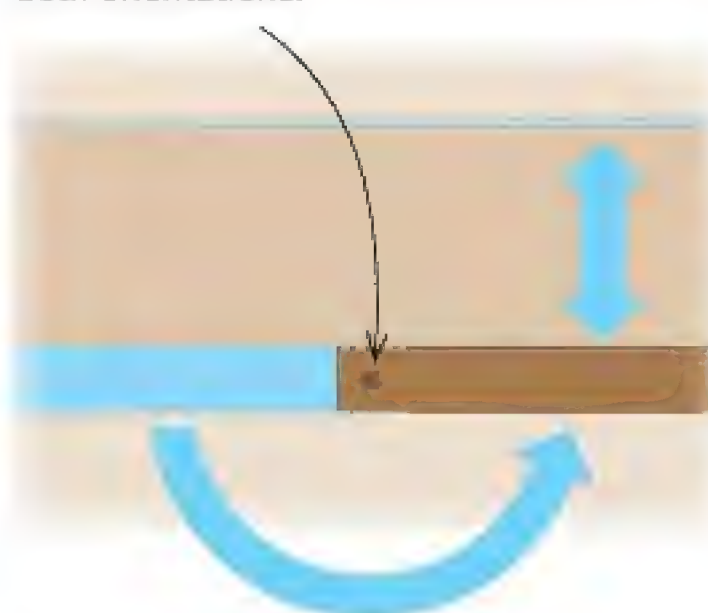
CENTER THE HOLE



Aim for the center. Do your best to adjust the fence so that the bit is centered on the leaf's thickness, and drill a shallow hole.



Drill bit should slide in smoothly in both orientations.



Drill, then flip test piece end for end to test fence placement.



Check your work. With the drill press off, flip the piece and lower the bit into the hole. If it enters smoothly, the hole is centered. If not, adjust the fence, cut off the end, and try again.

THEN LOCATE IT FROM THE END



Stop block steps in. Insert the bit into the hole, then align the test piece perpendicular to the fence. Clamp a stop block against it. This ensures that the hole is spaced an equal distance from the edge and end of the leaf.



Drill just past halfway. Then drill from the other edge. Check that the pin enters smoothly through the completed hole, then drill the real leaves.

(1/4 in., for example). Mill your leaves to final thickness and width, but leave them a bit long. Also, mill some extra stock to the same dimensions to help with machinery setups.

I use 1/8-in.-dia. brass rod for the hinge pin. For a wooden hinge to work without binding, the holes for the pin must be straight and they must align with one another. To ensure accuracy, drill the hole before cutting the knuckles. Use a short brad-point bit, slightly longer than half of the hinge's width, and drill in from both



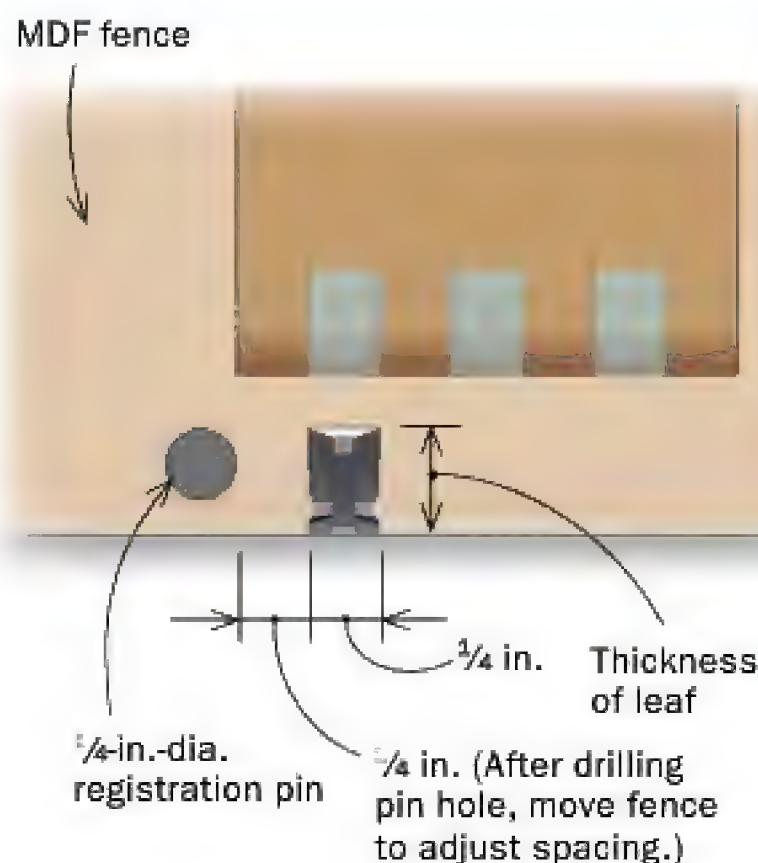
TIP

ROUND ENDS BEFORE CUTTING HINGE KNUCKLES

Routing the end grain after cutting the finger joints would result in tearout. Use a bit with a radius equal to half of the leaf's thickness.

Knuckles are finger joints

To cut the knuckles, Stowe uses a simple finger-joint jig clamped to the tablesaw miter gauge. He sets it up using test pieces.



edges of the leaf. The short bit is less likely to wander than a longer one. You can find short drill bits at woodworking-supply retailers.

Adjust the drill-press fence so that the bit is centered on the stock's thickness (see photos, p. 81). Use a piece of extra leaf stock to set up the fence. Drill the hole in all of the leaves (four, if you are making a pair of hinges).

After drilling the holes, rout the knuckles to create the rounded shape they need for the hinge to open and close. If you were to do this after cutting the knuckles, you'd surely get tearout on every one. Put a backer block behind the leaf to guide it through the cut, keep it square to the fence, and prevent tearout.

Cut the knuckles with a finger-joint jig

Now you're ready to cut the knuckles, which are really just finger joints. I cut them at the tablesaw with a shopmade jig (see drawing, above) and a box-joint blade that cuts a flat-bottomed 1/4-in.-wide kerf.

The jig is easy to make. Drill a 1/4-in.-dia. hole near the bottom edge of a long, narrow piece of 1/4-in. MDF. Put a registration pin in the hole. I use a 1/4-in.-dia. straight router bit for the pin. Next,



The first leaf has a knuckle on both edges. Stand the leaf against the registration pin for the first cut (left). It straddles the pin for the rest of the cuts (right), one notch aligning the leaf for the next one. Hold the top end of the leaf against the jig to keep it from moving.



The second leaf is notched on both ends. Use the first leaf as a stop (left). Its edge will align precisely with the edge of the blade's teeth, so the notch you cut is exactly 1/4 in. wide. With the first notch over the pin, the leaf is properly aligned to cut the second one (above).



Knuckle sandwich. The knuckles should come together with a bit of resistance, but you should still be able to move the leaves easily.



Knock in the pin. Put the hinge on a small scrap of plywood with a hole in it. Drive the pin through and a bit proud of the other side.

Glue and peg the hinge to the box

Start by notching the back of the box lid, and glue the hinges onto the lid first.



Attach the lower leaves second. Don't put glue where the leaf overlaps the lid or you'll glue the parts together.



Business card prevents binding. Use three cards, one each for the back and sides. Check the lid's overhang on both sides before clamping.



Add pegs for strength. On a rustic box like this, Stowe leaves the pegs proud of the surface.

clamp the MDF to your miter gauge so that there is a $\frac{1}{4}$ -in. space between the pin and blade. To set that space precisely, I use a second $\frac{1}{4}$ -in.-dia. straight bit.

Now you're ready to make a test joint. The first leaf has knuckles on both edges, so make the first cut with the leaf's edge against the pin. Put the first notch over the pin to cut the second notch. Repeat until you've cut all of the notches. The second leaf has a notch on both ends. Use the first leaf as a stop to cut the first notch (see photo, opposite page), and then put that notch over the pin to cut the second notch, and so on.

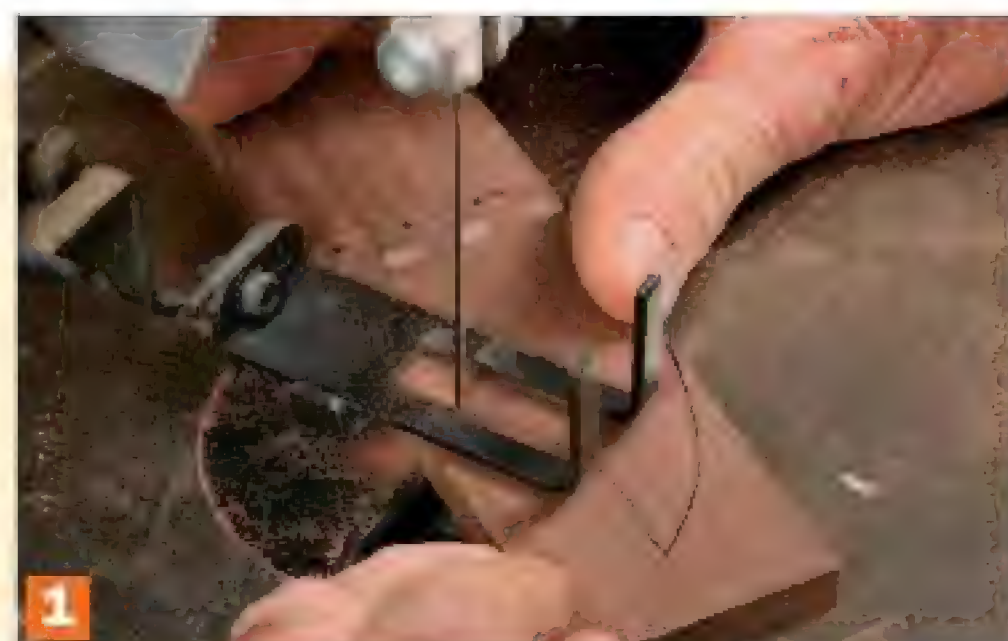
After cutting all of the notches, put the joint together to test the fit. If it's too tight, adjust the fence so that the pin is closer to the blade. If it's too loose, move the pin away from the blade. When you have it dialed in perfectly, cut the knuckles on the actual hinge leaves.

Now put the leaves together and drive the hinge pin into place. It should be tight enough to stay in place on its own but able to be removed in the future. I attach the hinge to the box and lid with glue, but I reinforce these glue joints with pegs. □

Doug Stowe is a professional furniture- and box-maker in Eureka Springs, Ark.

Let your designs run wild

Because wood isn't as strong as metal, wooden hinges necessarily are chunkier than those made from brass and other metals. I used to see that as a weakness, but then I learned to embrace their stature, shaping the leaves to emphasize their robust, organic, and rustic look. I gave up subtlety and got bold. That's why I styled the hinge leaves on this box to look like ... well ... leaves. Here's how I did it. After the hinge is assembled, rough out the leaf profile (1). Then soften the edges. I use a grinder with a 100-grit sanding disk to form a gentle organic transition from the top to the edge (2). Be sure to clamp the leaves securely. Finally, to add some texture, I used the wheel's narrow edge (3) to cut shallow "veins" in the leaf's surface.



Lapped dovetails are the right joint for a top rail

Q: In carcase and table construction, I often see a lapped dovetail joint connecting a top rail to the legs. Why is this joint preferred over mortise-and-tenon joinery?

—JOHN DENNIS, Temple, N.H.

A: LAPPED DOVETAILS ARE USED on a narrow rail above a door or drawer, where there isn't enough thickness for a strong mortise-and-tenon joint. A kick to the bottom of the leg, or the act of repeatedly sliding the table across a floor, creates racking forces at the top that want to pull the leg away from the rail. The lapped dovetail really shines here, because it has a mechanical advantage over mortise-and-tenon joinery. The angled sides of the tail pull the joint tight and lock it together, which means it can't pull apart, even if the glue fails. A single lap is strong, but I think a double lapped dovetail, in which the upper rail is joined to the leg and side apron, is stronger. Because a double lapped dovetail requires a wider rail and has two locking joints, it resists racking forces even better.

—Steve Latta is a contributing editor.

WHY SMALL TENONS ON THE TOP RAIL ARE A BAD IDEA

Because the tenon is in line with the forces working to pull the joint apart and offers no mechanical resistance to them, you're relying on your ability to fit the joint and the strength of the glue to keep the joint together.

Racking forces work to pull the legs away from the top rails.

An inadvertent kick to the bottom of a leg creates a lot of force at the top.

Dovetail socket in top of leg

SINGLE LAPPED DOVETAIL LOCKS THE PARTS TOGETHER

Angled sides prevent the tail from pulling out of the socket and provide resistance to racking forces in every direction.

Top rail has dovetail.

Dovetail socket in top of leg and side apron

DOUBLE LAPPED DOVETAIL IS EVEN STRONGER

Having two tails on a wide rail makes the base even stronger. Use this version of the joint when possible.

Wider top rail allows two dovetails.

Ask a question

Do you have a question you'd like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.

Easy fix for a gappy glueline

Q: I'm making Greg Paolini's Morris chair ("Build a Bow-Arm Morris Chair," *FWW* #205). When gluing the veneers to the legs, I ended up with some gaps along the glueline.

How do I fix them?

—ALBERT SISK,
Ayer, Mass.

A: EVEN USING LOTS OF GLUE, cauls, and a bunch of clamps, a gap between the veneer and the blank can happen. Before covering it up, check to make sure there's not a bigger bond failure. Do this by tapping on it to see if it sounds hollow. If that's the case, you'll have to plane off the old veneer, and apply a new one. It's a simple fix, but time-consuming.

If the gap is only cosmetic, ignore it until after the final layer of finish is applied. Then fill the gaps with hard wax sticks, which come in many colors to match the finish and are available at some home centers and finish-supply houses.

—Greg Paolini is a professional furniture maker in Waynesville, N.C.



Wax to the rescue. Push the stick back and forth over the gap, working the wax into the void.



Can you see me now? The wax stick does such a good job that you'll have a hard time finding the repair, and no one else will ever know.



The 110-foot flagpole in the center of Newtown, Connecticut has been a landmark since 1876.

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Gentle taps release stuck router bits

Q: After using a straight bit in my router recently, the bit wouldn't come out. I loosened the collet, but the bit is stuck good. How can I get it out?

—MICHAEL KAPLAN,
Gulfport, Miss.

A: STRAIGHT BITS CAN BE TOUGH to get out when stuck, because if you pinch them too tightly, you risk cutting your fingers. So, if a normal grip and muscle don't get it out, I'm afraid you'll have to coax it loose with a wooden mallet or a piece of wood. Don't give in to the temptation to rap the bit or collet with a metal hammer or to pull on the bit with pliers, both of which could damage the delicate collet threads.

—Roland Johnson is a contributing editor.



Unstick a stuck bit. The first thing to try is a bit of elbow grease, but take care not to cut your fingers (top). If that doesn't work, tap on the side of the bit with a scrap of wood or a soft mallet (bottom).

Protect outdoor hardware from rust

Q: Robert Erickson mentioned that he uses gun bluing and lacquer to waterproof some of the metal hardware in his Adirondack chair (How They Did It, *FWW* #231). I'd like to do the same. What's involved in that process?

—KEN BROOKS,
Johnstown, Pa.

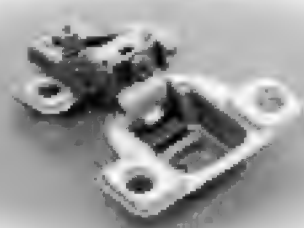
A: FIRST, LIGHTLY SAND THE EXPOSED METAL of the hardware. Next, prep the steel with Industrial Metal Supplies' Metal Cleaner (\$6, sculptnouveau.com), then use Birchwood Casey Super Blue (\$11, sport.birchwoodcasey.com) straight from the bottle. This darkens the metal, but does not turn it a true black. The color is more like the black on forged steel. (For a true black color, I use black lacquer.) After the gun bluing process is complete, I seal the metal with Clear Guard lacquer (\$13, sculptnouveau.com). For a marine environment, I use Ever Clear lacquer (\$26, sculptnouveau.com), which is a two-part acrylic urethane.

—Robert Erickson is a professional furniture maker in Nevada City, Calif.



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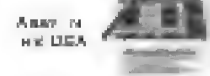
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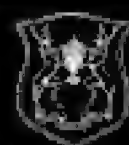
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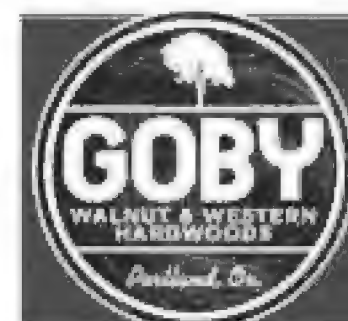
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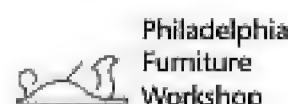
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how they did it

Prismatic patterns from a single plank

BY JONATHAN BINZEN

Laël Gordon compares the parquetry patterns he creates using a single species of wood to the “outfield grass effect” you see at the ballpark. He cuts the veneers so that the grain is perfectly quartersawn yet all the primary cells are oriented on a consistent slant. Then, depending on which way the individual tiles of veneer are turned, light will either be reflected by the cell walls, making the tile appear bright, or absorbed into the hollow cells, making the tile appear dark. If the light source is shifted from one end of the cabinet to the other, all the tiles will reverse, the light ones becoming dark and the dark ones becoming light. In very diffuse light, the pattern can disappear altogether. Gordon works from a full-size drawing, which he produces in a program called TurboCAD. For the veneer, he favors Douglas fir for its strong grain lines and its ability to take finish.

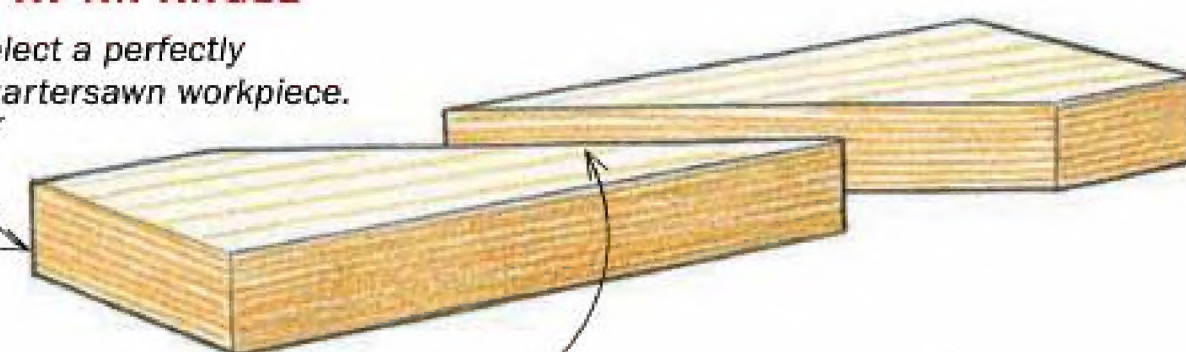


CELL SLANT CREATES THE EFFECT

By slicing along a plane diagonal to the vertical growth of the tree, Gordon generates quartersawn veneer in which the primary cells slant upward. These two tiles are from the same piece of veneer, but since one is turned end for end they reflect light differently.

1. RIP AT AN ANGLE

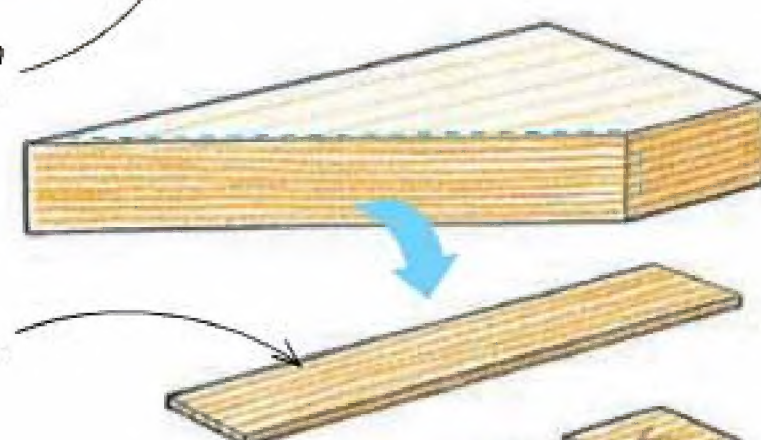
Select a perfectly quartersawn workpiece.



Cut it at about 25°. Then joint the diagonal edges.

2. SLICE VENEERS

Bandsaw $\frac{1}{8}$ -in.-thick slices, jointing the workpiece between cuts. In the planer, mill the slices to $\frac{3}{32}$ in. thick.



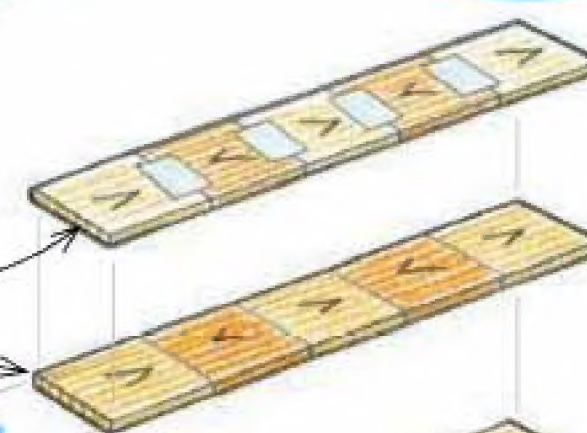
3. CROSSCUT INTO TILES

Crosscut the slices into square and rectangular tiles on the tablesaw. Then mark the cell direction on each tile.

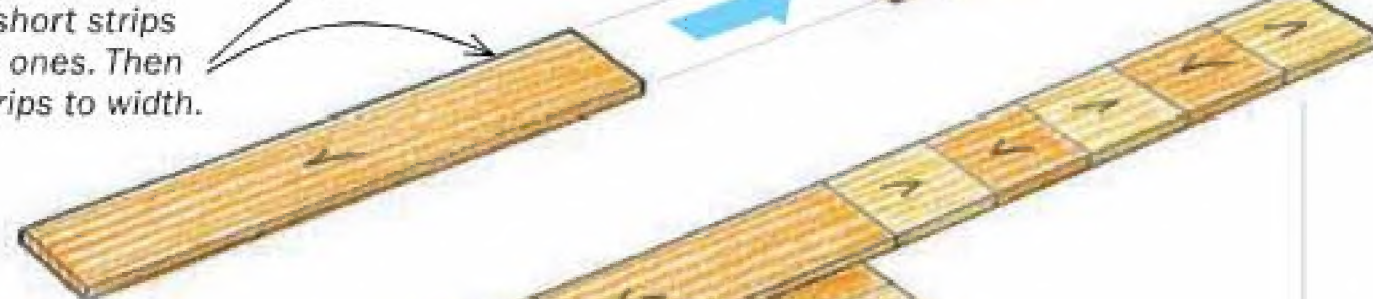


4. GLUE TILES INTO STRIPS

Using painter's tape on top, glue the tiles into strips 6 in. or so in length, weighting them down if need be.

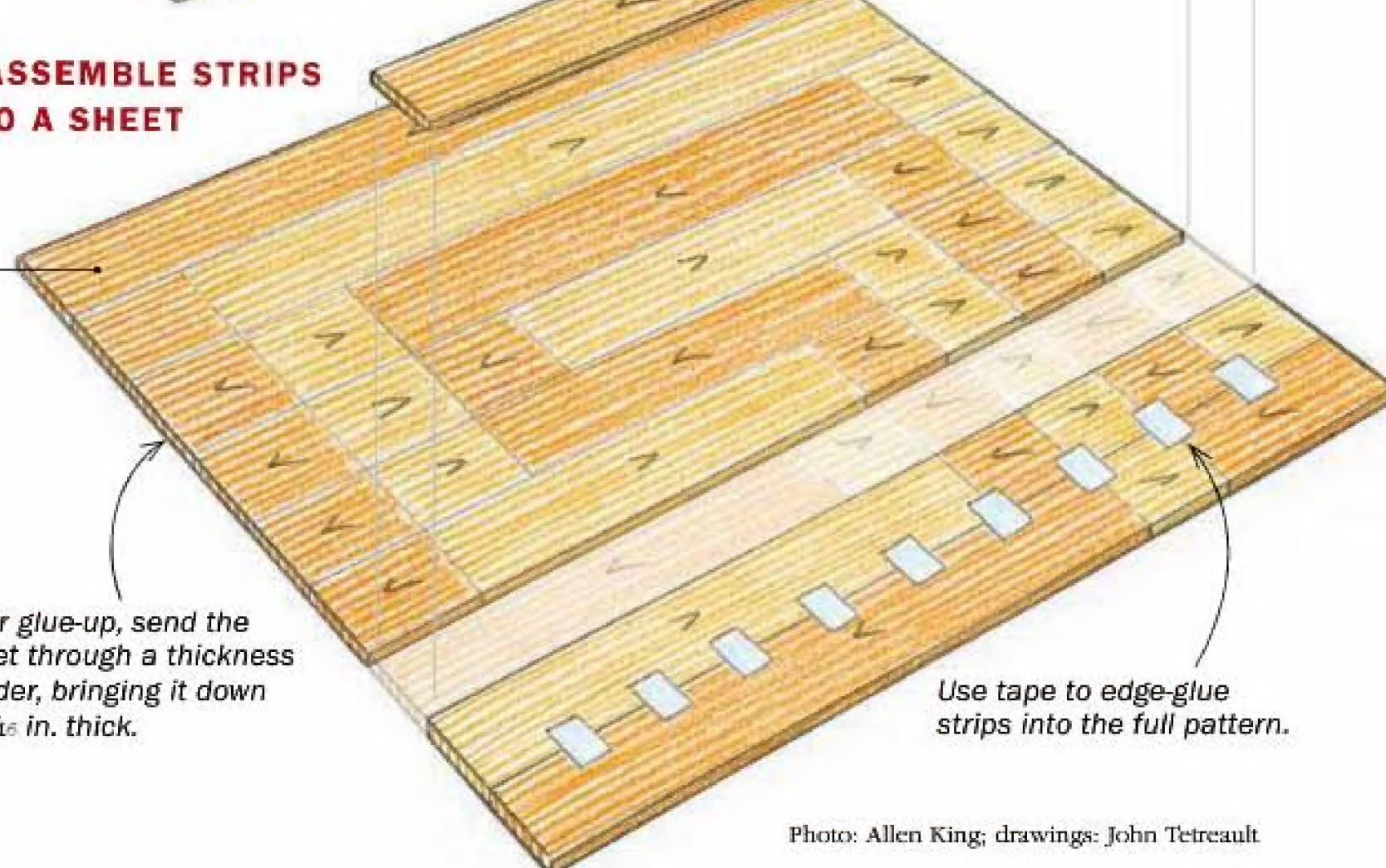


When the glue dries, assemble short strips into longer ones. Then trim the strips to width.



5. ASSEMBLE STRIPS INTO A SHEET

After glue-up, send the sheet through a thickness sander, bringing it down to $\frac{1}{16}$ in. thick.



Use tape to edge-glue strips into the full pattern.

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Shorter Open Time	✓	✓
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Patterns of Light

To embellish his cabinets, Laël Gordon creates contrasting patterns with shop-sawn veneer. But he manages to do it without using contrasting woods. In fact, he composes each pattern with veneer of a single species. The patterns, which shift dramatically depending on the angle of light and the position of the viewer, result purely from the clever way the pieces are cut and oriented. Gordon, who grew up on the coast of Alaska, the son of a shipwright, attended the Inside Passage School of Fine Cabinetmaking in British Columbia and considered a career in furniture making. But he soon realized that for him the pleasure in the craft lay in making each project an extended experiment. Not wanting to lose that latitude, he took a job as a math teacher at a technical college, which leaves his weekends and summers free for unfettered exploration in his shop.

—Jonathan Binzen



Photos: Allen King (bottom), Ingeborg Suzanne (top)

How They Did It Turn to p. 90 to see how Gordon arranges the grain and wood fibers of his veneer to get contrasting patterns.

Audio Slide Show To see more of Gordon's astounding furniture and marquetry techniques, go to FineWoodworking.com/extras.